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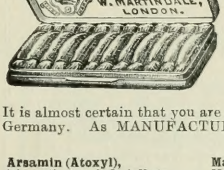

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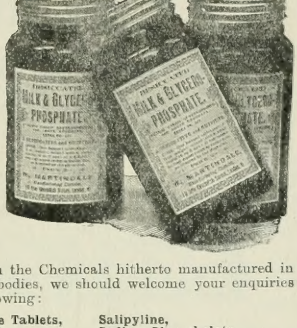

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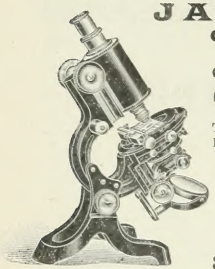

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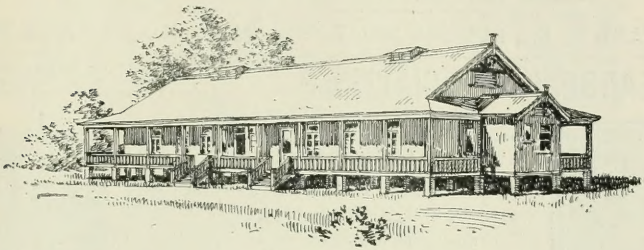

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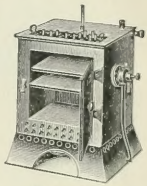

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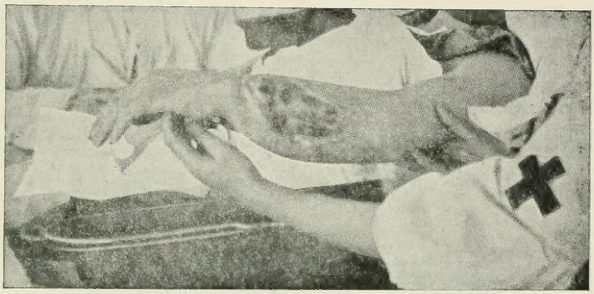

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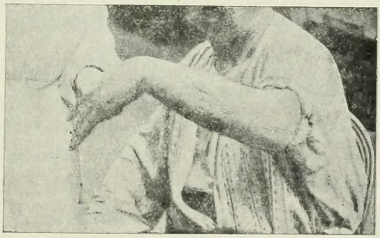

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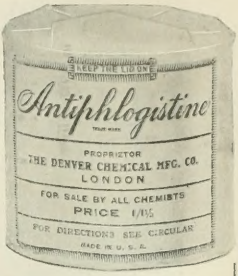

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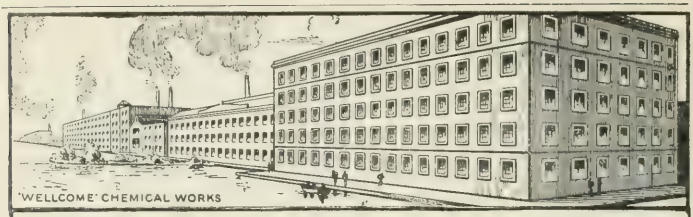

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To face first matter

VOLUME XXV. NOVEMBER, 1915. No. 5.

Journal
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Original Communications.

NOTES ON THE TREATMENT OF DIARRHŒA AND DYSENTERY ISSUED BY THE ADVISORY COMMITTEE FOR THE PREVENTION OF EPIDEMIC DISEASES IN THE MEDITERRANEAN EXPEDITIONARY FORCE.

BY TEMPORARY LIEUTENANT-COLONEL ANDREW BALFOUR, C.M.G.
Royal Army Medical Corps.

Member Advisory Medical Committee; Director-in-Chief, Wellcome Bureau of Scientific Research.

ONE of the best methods of preventing the spread of dysentery and other diarrhœal diseases is the prompt and efficient treatment of cases. The Advisory Medical Committee appointed by the War Office has therefore considered it desirable to issue the following notes on the treatment of dysentery and diarrhœa, for the guidance of those who may not have had much opportunity of handling cases of the various types of dysentery met with on the Gallipoli Peninsula, and in Imbros, Lemnos, and Egypt.

As dysentery of whatever form is usually preceded by an irritative diarrhœa information is also furnished regarding the treatment of this condition.

The treatment of all cases of enteritis may be divided into :—

(*a*) Dietetic.
(*b*) Medicinal.
(*c*) General and prophylactic.

(*a*) Dietetic.

As the earliest stages of amœbic, bacillary, flagellate, or ciliate dysentery cannot easily be distinguished from a mere irritative diarrhœa, the diet suitable for all these forms may be here considered very briefly.

It should in every instance be liquid and may consist at first of barley water, rice water, oatmeal water, albumen water, or chicken broth if available. Milk is better avoided during the first twenty-four hours. Thereafter it may be administered preferably diluted with water or barley water. It may be given malted or peptonized if the stomach is irritable. In the case of true dysentery it is very desirable to obtain fresh milk if at all possible. It is an advantage to add three grains of citrate of soda to each pint of milk, in order to prevent the formation of large curds. Bicarbonate of soda and sodium chloride may also be used for this purpose.

Alcohol is distinctly deleterious at this stage and should not be exhibited.

No solid food should be given until the active processes in the bowel subside, when arrowroot, custards, etc., should be added with due caution. In the early amœbic form soups are stimulating and often useful. In Egypt the easily assimilable curdled milk known as "laban zebady" will be found valuable in all forms of enteritis. In some cases it is found that throughout the illness milk cannot be tolerated. When this occurs, Benger's food, Brand's essence, bovril, and light soups may be given. In every case it is important to see that the food is neither too hot nor too cold, as otherwise colic is very apt to be set up. For the same reason food should be given in small quantities frequently.

(*b*) Medicinal.

(1) *Diarrhœa.*

The following remarks apply not only to simple irritative diarrhœa, but to the early diarrhœal stages of all the forms of dysentery above mentioned.

A case seen right at the beginning should at once be given one ounce of castor oil. If colic is present ten drops of tincture of opium should be added to the oil. This treatment alone, with rest, warmth and suitable dietary will often check the condition. It may frequently with advantage be followed up by one-drachm doses of castor oil in an emulsion given every four or six hours for twenty-

hours. At the same time, having regard to the difficulties in coming to an exact bacteriological diagnosis, emetine should be administered intramuscularly or intracellularly from the outset in the dose already recommended by Sir Ronald Ross, namely, two-thirds of a grain once or twice a day.

In severe cases which show every sign (colic, tenesmus, rise of temperature) of passing on into a true dysentery there should be no hesitation in giving a larger dose of emetine. As much as 2 or even 3 grains daily, say in ½-grain doses every four hours, may be administered so long as it is tolerated by the patient. The smaller dose will, however, generally suffice. Intolerance is usually shown by nausea and a tendency to collapse. Salivation may also be present. So far as is at present known there is little or no risk of a cumulative effect.

If the castor oil fails after fair trial it is well to have immediate recourse to the salines. The following prescription is useful:—

℞	Sod. sulphat.	gr. lx.
	Acid. sulph. aromat.	♏xv.
	Tinct. zingiberi	♏viiss.
	Aq. menth. pip.	℥i.

It may be given every two, three, or four hours, according to the severity of the case, and should be continued until the stools become watery. Sodium sulphate is on the whole preferable to the magnesium salt.

Note.—It would seem that calomel has not been so successful in the treatment of diarrhœa amongst the troops as the measures above indicated. Opium may be necessary if there is much griping, but is better avoided after the initial dose given along with the castor oil.

(2) *Amœbic Dysentery.*

Acute.—When the bacteriologist pronounces the case to be due to *Entamœba histolytica* infection, or when the symptoms (character of stools, course of the temperature, etc.) point to entamœbæ being the cause, it is necessary to continue the emetine treatment energetically.

A dose of one grain given once or at the most twice a day, and preferably by the needle deep into the outer portion of the forearm after careful skin sterilization is usually ample, but it must be remembered that emetine acts by killing the causative entamœbæ and preventing the formation of their infective cysts, and that emetine alone will not cure the ulcerative colitis which is speedily

established in a case of amœbic dysentery, nor has it any effect upon the secondary septic absorption which so often occurs. Hence to rely wholly on the emetine treatment is in many cases a mistake unless, indeed, it is instituted at the commencement of the illness, when it usually suffices.

Local treatment of the bowel is, therefore, indicated in all save mild and trivial attacks. For this purpose the saline mixture mentioned under diarrhœa should be continued four-hourly at first, and if necessary pressed; while washing out the lower bowel night and morning with a plain warm saline solution, administered by means of a douche can, is very sound and often affords great relief. The saline treatment also washes away amœbic cysts, and by its scouring action on the intestinal epithelium may possibly enable the emetine to act on deep-seated cyst-producing entamœba. Care should be taken that the nozzle used is sterilized after use, as infection has been conveyed by this means. Later on, when blood has disappeared from the stools but mucus still persists, daily enemata of tannin and quinine should be substituted. The lavage must be performed carefully and slowly, and continued until the intestinal effluent returns almost clear.

Dissolve 150 grains of tannin and 15 grains of quinine hydrochloride in a litre (1¾ pints) of warm water. If painful half strength may be employed.

Tannin alone, 0·5 to 1·0 per cent, may be used. Calcium permanganate, 6 grains or more to the pint, is an alternative solution. A sedative enema which may be tried with advantage consists of bismuth 2 drachms, tincture of opium 30 minims, and thin starch 2 ounces. When it can be managed an ounce of linseed soaked for several hours in 2 pints of warm water makes a soothing injection. A suppository of cocaine and morphine will frequently facilitate the administration of enemata and may also benefit spasms and tenesmus.

Sir James Crichton Browne has suggested that hypochlorous acid in the form of injections of "Eusol" is worthy of trial combined with saline lavage. This will soon be generally available and the Committee thinks there are good grounds for adopting the suggestion, though such a line of treatment is perhaps more adapted for chronic cases.

In very severe amœbic dysentery emetine should be given intravenously. As much as one and a half grains can be injected daily dissolved in ten cubic centimetres of saline. Emetine may also be given by the mouth in keratin- or salol-coated pills taken at

night on an empty stomach, but is not so good when thus administered. In all cases diminish the emetine as the case improves. Thus, as a rule, the daily dose can soon be reduced to half a grain. It is well to carry on the treatment for a week or ten days, then to give a week's rest and to start again if examination of the stools shows that a further continuance of the treatment is necessary. Another method is to give the daily dose for a week and throughout the second week to inject the emetine on alternate days. Save for the purpose of getting rid of cysts it is rarely, if ever, necessary to continue the costly emetine treatment beyond a second course. If emetine is going to do good its beneficial action is quickly apparent. It is well to remember that emetine itself may, even in medicinal doses, produce diarrhœa, and, when used in the form of suppositories, is said to have produced bloody stools. Hence, one should always ask oneself if a persistent diarrhœa in a dysentery case taking emetine may not be due to the drug and not to the disease. Failing emetine, recourse must be had to the old ipecacuanha treatment, which Sandwith describes as follows :—

"The patient is starved for four hours, say from 5 p.m.; at 8.45 p.m. a mustard plaster is applied to the epigastrium, the pillows are removed from beneath the patient's head, and 15 minims of laudanum in water are given to him. At 9 p.m. he has one dose of 30 grains of ipecacuanha, and to prevent vomiting he is kept absolutely at rest, the nurse being ordered to wipe his lips to prevent his even swallowing saliva for at least three hours, when he is allowed a small drink. The next night, with similar precautions, he is given 25 grains of the drug, preceded by ten drops of laudanum. On the third night he takes 20 grains after five drops of laudanum. After this opium is no longer required, and the ipecacuanha is gradually reduced to 5 grains and kept there till the course has lasted a fortnight, when the patient will have taken altogether 145 grains. The patients submit willingly to possible vomiting and rigid rest and make up by day for rather sleepless nights."

The form of ipecacuanha containing emetine is, of course, indicated. It is useful to add one part of tannin to three of ipecacuanha. The dose may be divided amongst four cachets, which are taken at the same time and continued daily for three days, then being gradually diminished.

During convalescence salicylate of bismuth should be employed if diarrhœa persists. Some employ bismuth in large doses either as the subnitrate or salicylate along with emetine throughout the

illness, but, so far as recent experience goes, the saline treatment seems to be preferable.

In all severe cases the tendency to heart failure should be remembered, and the value of hypodermic injections of camphor in this condition recalled.

(2) *Chronic.*—Here local treatment is most useful. "Eusol" injections may be tried. So may large enemata of copper sulphate 1 in 1,000, or nitrate of silver with opium and starch. It does not appear necessary to enter fully into this question as but little that is new or specially valuable has lately been advocated.

Note.—In every case of severe advanced amœbic dysentery the stools should, whenever possible, be carefully washed and searched for sloughs, as their presence or absence forms a most useful guide to the course of the disease and may indicate the need of caution in giving injections by the bowel.

(3) *Bacillary Dysentery.*

(1) *Acute.*—When the bacteriologist reports a case to be due to *Bacillus dysenteriæ*, or when the course of the disease (character of stools, course of temperature, etc.) points to invasion by a bacillus of the dysentery group, two lines of treatment have to be considered—that by specific polyvalent serum and that by salines.

Serum is now available and there can be no doubt that in many cases it is of great value. The sooner it is given the better. The dose is twenty cubic centimetres by subcutaneous injection, and as a rule this is sufficient, but if necessary as much as sixty cubic centimetres may be given at the outset, or the above dose may be repeated.

If salines are employed the sodium sulphate mixture mentioned under amœbic dysentery will be found to act well. As a rule it should be combined with simple lavage of the lower bowel.

In very bad cases drained by incessant evacuations, intravenous inoculation of saline on the lines introduced by Rogers for cholera will often save life, *but it must be resorted to in good time.* The special cholera outfit in two separate cases is now available and should be at hand for treating such cases of dysentery. Full directions are supplied with the outfit. An emergency injection consists of common salt 60 grains, carbonate of soda 60 grains, boiled water 1 quart. Give one to three quarts at a temperature of 100° F., carefully watching the effect. The danger of heart failure even at an early stage must be borne in mind.

(2) *Chronic.*—Local treatment similar to that employed in

chronic amœbic dysentery is indicated, and, if available, the organic silver compounds albargin (silver gelatose), 1 in 500, or protargol, 1 in 100, should be accorded a trial. Here, again, "Eusol" may find a useful field.

Enemata of olive oil sometimes prove very useful in this form of dysentery.

Note.—In cases of doubtful etiology there should be no hesitation in employing a combined therapy of emetine and polyvalent serum. In both forms of dysentery colic is benefited by turpentine stupes to the abdomen, while hæmorrhage may be controlled by morphia or adrenalin hypodermically, calcium chloride or lactate by the mouth, or oil of turpentine in capsules.

(4) *Flagellate Dysentery.*

The only form which need here be considered at length is that due to *Trichomonas hominis*, for this is the only form of flagellate diarrhœa or dysentery which has hitherto, so far as is known, been recognized amongst cases occurring in the Mediterranean Expeditionary Force. It cannot be recognized clinically, but may be suspected in cases of persistent diarrhœa with bright yellow stools. In any case, the other forms due to *Lamblia* and *Tetramitus* cannot be very satisfactorily treated.

Trichomoniasis, however, though troublesome, can be dealt with as follows: In the early stages give an enema of an aqueous solution of iodine 1 in 1,000. The water used need not be boiled as the iodine sterilizes it. Administer the injection slowly every evening for three consecutive days, giving one litre at a time. The iodine enema should be preceded by one of boiled water.

If the parasites persist a tablespoonful of the following mixture should be given every two hours for the first three days:—

℞	Infus. cinchonæ (1 in 50, not acid)	ʒiiss.
	Ext. cinchonæ	ʒiii.
	Tinct. cinnamomi	ʒv.
	Syrup. opii (0·5 ext. in 1,000)	ʒiii.
	Tinct. camph. co...	ʒi.
	Olei terebinth.	♏ xlviii.
	with	
	Gummi acaciæ	ʒss.
	Aq. flor. aurant.	ʒss.
	Aq. dest...	ʒv.
	Syrupi	ʒii.

In addition the following enemata night and morning are indicated:—

(a) 3½ pints of decoction of eucalyptus.
(b) 2 ounces of boiled water, yolk of an egg.
10 minims of laudanum.
15 minims of essence of turpentine.

This is Escomel's treatment, the essential of which is the exhibition of turpentine. It may be noted that for lambliasis the same author recommended calomel and aromatic castor oil.

(5) *Ciliate Dysentery.*

Balantidial dysentery has been recorded recently from Egypt. The treatment is unsatisfactory, but thymol may be given, and local treatment with organic silver compounds or tannin enemata tried. Emetine has also been recommended and used with some success.

(*c*) General and Prophylactic.

The necessity for absolute rest and warmth to the abdomen, as by means of a light linseed poultice sprinkled with laudanum, need scarcely be insisted upon, but the Committee would again emphasize the value of careful washing of the stools and a search for sloughs. It would also remind medical and sanitary officers that so far as amœbic dysentery is concerned, the post-dysenteric case with formed stools or slight diarrhœa is much more dangerous to the community than the man suffering from acute dysentery. It is in the former that the resistant cysts are found which may infect food, water, dust, and flies, and find their way by one or other of these channels into the human host.

Emetine is apt to fail in the eradication of these cysts, but this is by no means always so. The following measures now employed to protect France from the introduction of amœbic dysentery by convalescents from her Eastern Colonies are worthy of note, and might be followed with advantage.

Four or five grains of emetine hydrochloride are dissolved in tincture of opium in the strength of one in fifteen. Eight to ten drops of this mixture are added to a cup of strong tea and given nightly, emetine hypodermically being reserved for acute cases. Such a measure would seem advisable in the case of men getting ready to leave hospital and in convalescent and rest camps.

General sanitary measures which are of the highest importance, as, for example, the provision of fly-proof and wind-proof box latrines, etc., do not fall within the scope of this memorandum.

It is important to note that emetine has no action on the cysts themselves. It only attacks the entamœba which produce them, and its failure is probably to be attributed to the vegetative forms being in some position where the drug cannot readily get at them. This, however, is only a hypothesis, for our knowledge of the subject is far from complete.

As regards flagellate dysentery, Castellani has recently recommended the use of methylene blue, 2 to 3 grains thrice daily in cachets, combined with intestinal irrigation (1 in 5,000 or 1 in 3,000). In obstinate cases where the treatment has to be carried out over a long period, the drug should be discontinued from time to time, to prevent the formation of methylene blue concretions in the intestines.

SOME EXPERIENCES OF A PRISONER OF WAR IN GERMANY, WITH REMARKS ON FOUR PRISONERS' CAMPS.

By Captain W. K. BEAMAN.
Royal Army Medical Corps.

The writer feels that these experiences may be of interest to readers of this Journal, and that they will be of value in helping them to form a clearer and more correct opinion of the German character.

One of the many things that has struck the writer most forcibly during the past month—that is, since his liberation—is the misconception of the German character displayed by the average Englishman, whether civil or military.

Some fourteen medical officers, all belonging to mobile medical units, were captured on August 26, 1914, at Landrecies, where there had been a fight during the night (25th to 26th). We had formed three hospitals in the town, and were in charge of severely wounded men.

The German officers and men who captured us, and practically all the others who visited us from time to time, were quite polite. They took nothing from us. They were very suspicious and very particular about collecting all the arms of the wounded. One medical officer took some dressings, but returned them later upon the order of a senior officer.

The officers asked few questions, assured us that the British Army was destroyed, and that Paris would fall in a few days.

The town was looted, private houses were broken into, and the furniture wantonly destroyed. There was some difficulty in obtaining supplies for our personnel and wounded.

Most of the local inhabitants had fled, including the doctor and the mayor. At the time one was inclined to blame these people for deserting their posts. In the light of later events one is forced to acknowledge that they were quite right. On the 28th the mayoress returned, and was exceedingly kind and helpful in obtaining supplies for the wounded.

Our Senior Medical Officer now made an official application to the General Officer in Command of the nearest Army Corps for our return either to our own lines or to a neutral country. He was informed that we should be returned, but must first pass through a German base. Orders were given for a move on the morrow (the 29th), and to take with us all wounded capable of travelling.

On the 29th the very severe cases were collected in a school which had been converted into a hospital. Two medical officers and some men were left in charge, the remainder set out for Bavai about 2 p.m. with an escort.

The commander of our escort was a *Feldwebel* (a warrant officer), and was very good on the whole. He saved some of our horses from being taken by passing troops, and carried off a difficult position with much tact and good humour.

The journey was uneventful. We stopped two nights and a day at Bavai to rest the wounded, who were cared for in the French hospital, and then proceeded to Mons.

The feeding of the personnel was difficult, but we were able to obtain a certain amount of bread on requisition and some live pigs. Pork in August cooked before it is cold is not an ideal ration, but was most acceptable under the circumstances. The Mayor of Bavai (long may he live!) gave us a barrel of beer.

We arrived at Mons on the evening of the 31st. Here our treatment completely changed. The column with wounded was marched twice round the town. The local inhabitants were most kind, and gave the men chocolate, cigarettes, cigars, and tobacco, till stopped by the German soldiers. We were finally hustled into a large barrack yard, and were ordered into a large dormitory over the stables, personnel and wounded all together. We were made to wade through stable drainage to reach this haven, the boards which were used to cross it being kicked away by our new guards. No food or water was supplied either to the personnel or the wounded.

Through the kindness of a sentry we were enabled to get some water in our dixies, which we fortunately brought with us. The wounded received a light meal of milk and biscuits supplied from our panniers. This was the last meal many of them received for some time. We did not get much sleep as the place was so dirty.

At 4 a.m. on the 1st we were aroused and ordered to start at 6 a.m., leaving our wounded. One biscuit per man was issued, and we marched to the station under a guard with fixed bayonets. Hitherto our escort had not fixed bayonets. After waiting some two hours in the square we were separated from our transport and interned in a shed in the station yard. We were given no food, nor were we allowed to get food from our transport. All requests, including a request to see the Commandant, were met by insults. We spent a very unpleasant day and were ordered to entrain about

6 p.m. The officers were entrained in a second-class carriage. The personnel and transport were left behind. Before entraining all knives and razors were taken from us.

The journey was uneventful, only marked by the absence of food, until 6 p.m. on the 2nd, when we arrived at Achen.

Here a mob of drunken Uhlans and railway employees were incited by a German officer—a colonel—to take us out of our carriage. He said it was scandalous that we who had gouged out the eyes of German wounded with the marlin spikes of our clasp-knives should travel in a second-class carriage, while German wounded were in trucks. Several of the mob had these English clasp-knives and were threatening to practise upon us, some tried to hit us through the windows, and some were making efforts to get into the corridor, when a younger officer came up and quelled them.

The howl of an angry mob is most unpleasant and terrifying. The writer for one never wishes to hear it again, the song of the shell is far preferable. We were now given a special guard who were very suspicious and stand-offish at first, but rapidly thawed. We owe this guard much, for by their kind offices we obtained some food. The German Red Cross give no food to prisoners, wounded or otherwise. At times it is shown to them and then withdrawn, with kindly remarks that its not for swine.

We were visited by a German officer and complaints were made of our treatment, and a demand made to see the German Commandant or the American Consul at Colne. We were informed that there were various charges against us, and that we should be searched and examined later.

At about 6 a.m. on the 3rd, we arrived at Dortmund, and under a very heavy guard we were marched to the Station Kommandatur. Here our Senior Medical Officer had an interview with the Commandant, who was very polite and accepted our word that all charges of ill-treatment of German wounded were false, and further ordered the Red Cross to give us food. This they did very unwillingly. One lady, when asked if she could speak English replied : "I can, but I won't." After our meal our journey recommenced, but under better conditions. The guard protected us from insults and we were allowed to buy a meal at Kriensen, about 9 p.m., the first meat we had had since Bavai on the 31st. We were given another meal on the morning of the 4th, and arrived at Torgau about 1 p.m., after nearly eighty hours in the train.

Torgau is an old fortress where French prisoners were interned in 1870. The writer has vivid memories of the first night when he

was driven from his bed by bugs. After a dour struggle he capitulated and spent a fairly peaceful night on the floor.

A general outline of conditions at Torgau follows. Torgau is a lager for officers. There were some sixty British officers and some hundreds of French officers already there on our arrival.

Housing.—Officers were housed in soldiers' barrack-rooms. Each had a bed and most of them had a soldier's cupboard. The bed consisted of a straw mattress on boards supported on an iron frame. Bedding consisted of two blankets, one sheet, pillow slip, and blanket bag. The latter acted as a second sheet. Linen was changed monthly. Later, when prisoners became more numerous, huts were put up and the junior officers were housed in these. Here they had no cupboards and very little furniture. The rooms were warmed by stoves.

Messing.—There was a small kitchen and a very small and dirty canteen. At first the kitchen was managed by a staff of German women. Later it was taken over by the French who managed all the messing. Food was bad but cheap. One could buy extras such as jam, ham and sausage at the canteen. With extras one lived on between 2 marks and 2 marks 50 pf. per day.

We were formed into messes of twelve to sixteen and dined in the corridors. One large dining-hall was erected but was insufficient to hold all and was used by the French. We had to buy all our own cutlery and crockery. The kitchen was much too small to cook for 1,100 officers.

Latrines.—We used the same latrines as the German Guard. Extra ones were built later. They were very dirty and only cleaned out when absolutely necessary — urinals were usually allowed to overflow.

Ablution.—There was a good system of shower-baths with hot and cold water. We could get a daily bath. It was necessary to pay the caretaker. We had hand bowls and a pump in the yard for washing our hands. One towel was supplied to each prisoner.

Exercise.—At first we only had a small yard about one hundred by sixty yards, but later the outer court was opened, where we had ample room and could play football, rounders, and tennis. The tour of our domain was nearly a kilometre.

Work.—Medical work, *nil.* At first we had to do all the work of the place, i.e., clean our rooms, clean the courtyard and the drains, wash up crockery, draw rations, wash clothes, carry coal, and peel potatoes. On September 17 some orderlies arrived, one for about sixteen officers. This relieved us of the most unpleasant

fatigues, such as washing up and the care of drains. We still had to help a good deal, and the early morning potato peeling roster persisted almost to the end. Peeling potatoes at 7 a.m. in the open on a cold November morning is not a desirable occupation.

Discipline was not strict—we had one roll-call a day at 10 a.m., except for a short period when we had two as a punishment for some offence.

Several petitions for release were sent in by the medical officers, of whom there were thirty British. All were unsuccessful. We were not allowed to see any newspapers with the exception of the official *Extrablatts* posted in the camp. Later we were allowed to buy the local paper. No letters were allowed to be sent off till October 6. The writer got no news from home till October 19, when a telegram arrived. It was sent off on September 2.

The following letter to the Senior British Officer from the German Commandant is worth recording:—

"Every day applications from British officers reach me which are so entirely without justification that it is not worth my while to take any notice of them. Officers appear still not to realize the fact that as prisoners of war they have not so much rights as duties. They are not to take up my time with the expression of foolish wishes. If this state of things, which betrays a certain bumptiousness on the part of British officers, does not cease immediately, I shall take the opportunity to put into each room a French sub-lieutenant risen from the ranks, and I shall further apply that a proportion of your Allies, the Russian officers, may share your rooms. This order of mine is to be posted up in the British quarters. Will you please, Colonel, report to me in German the fact that these instructions have been complied with.

"(Signed) BRAUN, *Captain.*

"Officer Commanding, Prisoners' Depot."

Here is a reply to one of our petitions for release:—

"Torgau, September 18, 1914.

"Colonel Gordon,—The doctors and chaplain are not, as was communicated to you in the beginning, looked upon as prisoners of war, and are not being treated as such. They have rather fallen into our hands and are to follow their avocation under our direction. We are only at the beginning of the enormous World War and shall still have many thousands of English wounded to care for, for which purpose the accumulation of English doctors will be detailed. The same is the case with the chaplain, who can, and does, already carry out his duty. Only when the personnel of the

Red Cross is no longer required—that can only be towards the end of the War—can there be any talk of return to England. If the gentlemen imagine that they cannot move freely in the town is a breach of the Convention, so must it be mentioned that the Convention expressly demands that doctors should be protected. Their detention is protective, as our populace is particularly bitter against the English as the promoters of this War. It would be almost impossible for the authorities to protect them in the interior of the town. At any rate, the above-mentioned officers obtain the same rate of pay as officers of the same rank in the German Army.

"(Signed) E. BRANDE."

With reference to the above letter it is worth noting that medical officers at this time received 100 marks a month. The writer received pay at the rate of 100 marks a month for five months, and at 595 marks a month for the second five months.

As regards employment, the writer was not employed in any way till February 11, 1915. From February 11 he was nominally employed in the care of some seventy British prisoners, whose wounds were practically healed, in a camp where there were two German, two Russian, and twelve French doctors.

On September 22 a notice was posted asking British officers to subscribe to the German Red Cross. Many officers subscribed by cheque. The receipt of these cheques by the London banks was the first intimation received in England that these officers were alive. The writer's wife was notified on October 7, having been without news of any kind since the middle of August.

An extract from a German paper, the *Leipsiger*, No. 247, published from September 3 to 10, is worth reproduction:—

"*Unworthy Behaviour towards Prisoners of War.*—In the first few days several hundreds of persons have thronged to the prisoners of war in the most persistent manner and have helped them with "presents of love" (Lebensgeben), especially tobacco, money, and flowers. Further, professional and amateur photographers have appeared in such numbers that it almost seems as if it was the most important task of the German photographer to obtain pictures of French prisoners. It is pitiable and incomprehensible that the earnest recommendations that have hitherto been issued have not sufficed to put an end to behaviour which amounts to hysteria.

"The Commanding Officer of the Bavarian Army Corps is compelled to forbid photography. Further care has been taken that the names of those people who, devoid of any patriotic feeling and

devoid of tact, have provided the prisoners with gifts should be at once taken and published in prominent places in the daily papers."

Life at Torgau was monotonous. One learnt French and taught English, but one got sufficient exercise. The writer spent five months there grousing at his lot, and a second five months elsewhere wishing he were back again.

One British officer called a German workman "a Schwein" because he dropped a hammer on him. The officer later got five months' imprisonment for this offence.

On November 25 and 26 all British officers were transferred to Burg. The procession from the camp to the station was unforgetable. Very limited transport was allowed, so each officer carried nearly all his worldly possessions. These were packed in anything between a Wolsey valise and a jam bucket. It was snowing hard too. We had a great send-off from our French Allies and many of us left behind very good friends. The writer was fortunate in only remaining at Burg some ten days.

General Conditions at Burg.—All knives and razors which we had bought at Torgau were taken from us. All ranks were mixed up, colonels receiving the same treatment as subalterns. Equal numbers of Russians and English were placed in each room, and no two English officers were permitted to sleep side by side.

Housing.—We were lodged in converted gunsheds and stores. Some rooms were fairly good, others were very bad. The lower rooms were quite unfit for occupation. Here are particulars of one room. It had accommodation for about forty officers. Windows on one side only. The window space was about a quarter of that allowed for a common lodging-house in England. These windows were hermetically sealed by large iron doors for twelve hours out of the twenty-four, i.e., from about 6 p.m. to 6 a.m. Ablutions were performed in the passage or in the room. All meals were taken in the room. The bedding was better than at Torgau, officers' sheets and iron bedsteads with a sort of spring mattress were provided.

Discipline was strict and oppressive. There were some thirty-nine rules. Roll-call took place at uncertain hours, sometimes once, sometimes three times a day. Beds had to be made in a fixed way. It was forbidden to sit or lie on the beds during the day. Walking in the courtyard after dark was forbidden, but we could go to the latrine one at a time up to 9 o'clock. A German non-commissioned officer was in charge of each room to enforce discipline. One officer who possessed a deck-chair was permitted to sit on it, but not to lounge in it fully extended. All the German

officers were very hostile to the British, but were much less so to the Russians and the few French who were there. All windows had to be shut at night.

Latrines.—Deep trenches, very dirty and quite insufficient. Only eight seats were provided for about four hundred officers, situated fifteen yards from one canteen and about forty yards from the other. Urinal usually overflowing and the urine permeating into the soil.

Ablution.—One small bathroom with two baths, quite insufficient. One bath a week only allowed. In addition we had basins in our rooms.

Messing.—Three official meals a day were provided by the administration. The price of this was stopped from our pay. The food was generally eatable but the quantity was insufficient. There were two good and clean canteens where at first one could buy excellent food. By degrees nearly everything was forbidden.

Exercise.—The courtyard available was about two hundred yards long by thirty yards wide, for about five hundred officers and men. Further, we were not allowed to cross it at the lower end, so had to walk up and down instead of making a round.

Work.—Medical work, *nil.* We had sufficient orderlies to do our other work. Washing was sent out to a laundry.

Irish Roman Catholics were separated from the rest with a view to preferential treatment. When it was realized that they were not inclined to espouse the German cause the matter was dropped. Some thirty-seven of us left Burg for Halle on December 6. The writer, for one, had no regrets.

General Conditions at Halle.—Halle is a large, dirty manufacturing town. The lager was an old factory converted. Dirt was the prevailing feature.

Housing.—British, French, Belgian and Russian officers were all lodged together in large dormitories. Numbers varied; in the writer's room there were thirty-four. In some rooms the beds were two-deckers, and all were of the same type as at Torgau. No cupboards of any kind were provided and some of us had no shelves or even hooks. The rooms were very dirty and ill-ventilated, with windows on one side only. The number of orderlies provided was quite insufficient to keep the place approximately clean. The bedding was the same as at Torgau, and linen was supposed to be changed monthly. The writer had the same linen for nearly two months. Lice were fairly plentiful.

Latrine.—Deep trench, very dirty, insufficient, and only cleaned out as a last resource.

Exercise.—The factory yard, dirty and rough; the round was some three hundred yards.

Work.—Medical work, *nil.* We had to clean our own boots and help with the messing arrangements, as the number of orderlies was insufficient, and further, they were constantly taken away by the Germans for fatigues. Washing was sent out to a laundry which was good and cheap.

Messing.—We messed in an enormous old workshop which was filthy. We formed messes of about ten. The food was cheap and very bad. Certain extras such as sausage, ham, jam and margarine were procurable at the canteen. All luxuries were strictly forbidden.

Ablution.—A good and fairly clean bathroom with shower-baths, also a lavatory not too clean. One could have a daily bath.

Discipline.—Not so strict as at Burg, two roll-calls a day. The German officers were quite agreeable and polite.

Life at Halle when one got used to the dirt became bearable. Several incidents are worthy of being recorded.

During December and part of January all foodstuffs were taken from our parcels "for the Red Cross." We were unable to obtain a receipt from the Red Cross. It was heartrending to see plum puddings and cakes go away like that.

The sale of tobacco at the canteen was forbidden and on the last day we all laid in large supplies. Two days later, on January 4, all smoking was forbidden, and on January 5 all the tobacco we had bought was taken from us, that is to say, all that was found.

Twice, on December '19 and January 26, we were stripped to the skin by civilian detectives in the presence of private soldiers without the presence of an officer. Dogs also assisted. We thought they were searching for gold, they did not find much. They took a few other items such as field-glasses. We were searched on another occasion by the military authorities for maps and note-books. Some of the latter were probably interesting as critiques on German methods. We were all disinfected and our clothes were baked. This procedure ruined many uniforms, particularly breeches, and was quite useless from a practical point of view. Many articles of clothing were lost altogether. Several officers were sent to prison for disobeying the smoking edict. One medical officer who had undergone two months' solitary confinement was in this lager. The writer was on February 11 transferred to Quedlinburg, a man's camp, where he was nominally in medical charge of the English prisoners.

Condition of Medical Officers at Quedlinburg.—We, that is

twelve French, two Russians, and the writer, were housed in small wooden huts. For some time there were eight of us in a hut, seven metres by five. We each had a chair and there were two small tables. No cupboards or shelves were provided. No baths were available, so we had to tub in the room. We had one fairly good meal a day at the kitchen, for which we paid 1 mark 50 pf. We made and cooked our own breakfast and supper, from the contents of parcels and from such food as we could buy locally. Later we were given a third hut, so that we only had five in a hut. That was a great improvement. The duties were very light, as most of the wounds were healed, and with the exception of tubercle, which was prevalent in every form, the health of prisoners was good. The writer's official capacity was Reserve Medical Officer for "Feld III." Practically he looked after the English, whose numbers varied between sixty-one and eighty-one. For exercise we had the "Feld" yards, which were about two hundred yards long. We could move freely from one "Feld" to another, but were forbidden to enter the men's hutments. When the new "infirmary"—really a medical inspection room—was completed, good baths were available.

There were about ten thousand prisoners, Russian, French and English. They were all inoculated by us against cholera and typhoid.

Smoking was for a time forbidden, but later was allowed with certain restrictions as to time and place. For medical officers latterly there was practically no restriction. We were not allowed to leave the camp except to proceed to the camp hospital, when we were accompanied by an armed guard.

Conditions of the Prisoners at Quedlinburg.—The camp is administered by a general. The prisoners are divided into two battalions of four companies each. Each battalion is commanded by a major, and each company by a captain or subaltern. Each company is a separate unit with a permanent staff of German N.C.O.'s.

The companies are divided by barbed wire fences. One kitchen cooks for two companies. The main latrines are well away from the kitchens. They are deep trenches, cleaned out by hand into carrying barrows which are by no means watertight. Considerable soiling of the camp occurs in the process of cleaning. There are smaller latrines in close proximity to the kitchens. Some latrines are now emptied by a kind of pump.

Housing.—The men are housed in long wooden huts which are not rainproof. There are two types of room. One is 75 feet by

35 feet and holds about 150 men. The air space in the other type is similar. Mattresses stuffed with shavings are allowed in the proportion of four mattresses for six men. Two blankets per man are issued. The rooms are heated by stoves and have sufficient windows.

Food is meagre and very unappetizing, in fact at times uneatable. The writer believes that counting it in calories it is sufficient to support life. The warning with reference to overloading of the stomach mentioned in paragraph 7 of the German official instructions is faithfully carried out. The potato bread is very nasty, it is rather like india-rubber; all the same, a larger ration would be very acceptable to the prisoners.

Breakfast consists of black coffee. The coffee is said to be made from acorns.

Dinner.—A vegetable stew flavoured with meat or fish. It would often be better to leave out the meat or fish.

Supper consists of a "soup" made of starch in some form and water. Rice, flour and beans are usually employed. Two hundred and fifty grammes of potato bread is issued daily. Fresh milk was not available at Quedlinburg. Tinned milk, sardines, potatoes and inferior kinds of sausage can be bought in the canteens. Without parcels from home the men would almost starve. The Russians suffer badly in this way and their health is not nearly so good as that of the British and French. The feeding has improved somewhat since the administration have taken over the messing in place of contractors.

Work.—The fatigues are not now heavy. While the camp was in the making and the weather bad the work was hard. Men who are ill or incapacitated by wounds can obtain exemption tickets from the medical officer in charge.

Medical arrangements are satisfactory. There are ample dressings, drugs are occasionally short. The new hospital is good. The old one left much to be desired. An isolation hospital is ready in case of an epidemic.

Health.—General health fairly good. Tuberculosis in every form is rife, also pneumonia and bronchitis are common. All this is due to the overcrowding in the huts and deficient food. Much of the overcrowding might be prevented by local organization, as there are often empty huts available. Out of one hundred and one deaths in the hospital up to May 10, 1915, forty were due to tubercle, and there have been others since then. No isolation of tubercle patients is carried out. There are many men of all nationalities quite incapable of serving who should be exchanged.

Clothing.—Practically no clothing is provided by the German administration and it is very difficult even to obtain clothing sent out from England for the British prisoners. Clogs made of solid wood or of wood and leather are issued from time to time to men who have no footwear whatever. Smoking is allowed in the open at certain hours. Tobacco is now sold in the canteens. Parcels arrive fairly well. Few are lost. They usually take about a month to arrive. Letters are variable and many are lost. On one occasion I know a simple method of censoring was employed, a sackful being burnt.

Discipline is fairly strict and is enforced sometimes in an unpleasant manner.

One may gather from these remarks that the lot of a prisoner of war is not a pleasant one, but it is much better now than during the early months of the war.

The British owe a great debt of gratitude to the American Ambassador at Berlin who, in the face of much obstruction and subterfuge, has done so much to relieve the sufferings of our prisoners. Much yet remains to be done, and it must always be remembered that an inspection of a camp is a set piece, much forethought being expended by the authorities as to the staging.

The writer himself owes much to his French and Russian colleagues at Quedlinburg and to the many good friends in the French rank and file. Arriving at Quedlinburg alone, the only British officer, he was welcomed like a brother and everything possible was done to make his lot as comfortable and happy as possible. He left Quedlinburg feeling quite certain that the interests of the British prisoners would be thoroughly well looked after by their French Allies. A French adjutant was left officially in charge of British interests and he has done much good work already and is willing to do any amount more.

SOME MUSINGS OF AN IDLE MAN.

By Colonel R. H. FIRTH.

I.

A short time ago, I was on a steam trawler and had opportunities of observing the huge catches as they were emptied from the nets on to the deck. As one stood and contemplated the myriads of these denizens of the sea, one could not help wondering at the abundance, its continuance from day to day, year in year out, and as to what happens in the vast economy of the ocean. There were tons and even miles of fishes, to say nothing of the countless numbers of great and small crustaceans, copepods, diatoms, and the multitudes of infusoria. The fishes alone represented a recent locomotor power in the sea which the mind could not grasp, and yet a power soon to be transformed into a corresponding enormous power of both muscle and brain work on land. Even the offal or rejected sweepings would go to feed cattle and to fertilize the ground. One was almost aghast at the magnitude of the problems presented, and one's thoughts took the following direction.

The producers of the wealth of the ocean are the chlorophyll endowed organisms, most of which are undoubtedly plants. Of these plants, there are two great groups in the sea : first, the phytoplankton or minute algæ of the superficial layers of the ocean and, second, the larger seaweeds or sea-grass, and the attendant microflora abounding in the shoal waters or shore areas. Possessed of varied pigments, all these have chlorophyll and, by virtue of that complex of glucosides, are able to utilize the energy of sunlight to build up the simple constituents of air and sea-water into more complex organic products, which, in turn, form the food of animals. On this power of photo-synthesis depends clearly the whole economy of marine and terrestrial life. Our thoughts then picture the minute and simple algæ of the open seas as so many floating meadows, and on these pastures feed many inhabitants of the open seas, such as small crustaceans, which again are devoured by young fishes. In this sequence of events we conceive the growth of the sea-meadows in spring to be as important as the garment of green on a farmer's field. Close thinking further explains the observed correlation between the sunshine records of May and the quantity of mackerel in the fish markets. The rationale of this is instructive and simple, because there is a correspondence between

the catches of mackerel during May and the amount of small crustaceans of drifting habit, or plankton, upon which the mackerel feed. These small drifting crustaceans or copepods, in turn, feed largely on the drifting algæ and plant organisms of the surface waters, such as diatoms and peridinians. But the multiplication of these minute organisms depends in the main on the amount of sunshine, so that we come to the sequence of the more sunshine the more mackerel. The incarnations follow one another, copepod after diatom, mackerel after copepod, and man after mackerel; truly, a marvellous illustration of the circulation of matter, and a suggestion that as, on land, all flesh is grass, so, in the sea, all fish is seaweed. Important as the minute constituents of the phyto-plankton are in life, they seem equally important in their death. For when they are killed by changes of temperature or when they reach the end of their natural growth, they add to the valuable organic detritus which remains in suspension in the water or sinks to the floor of the sea. Thus, we come to the conclusion that the producers in the economy of the sea are the chlorophyll endowed plants and such small animal organisms as have stolen their secret of photo-synthesis.

If such be the producers, who then are the natural consumers of the wealth of the oceans? First, there are true carnivores, like most fishes, all the cuttle-fishes, the whelks, and many gasteropods, most of the starfishes, many of the crabs, and so on down to the sea-anemones. To these we might add certain vegetarians, like limpets and periwinkles, on the shores, and some of the open-sea animals like the copepod crustaceans; while a third group of consumers is the enormous multitude dependent on detritus. Though one thinks thus of the consumers, one does not put the classification rigidly, for it is probable that the distinction between carnivore and vegetarian is not so important as that between organisms with and organisms without hard prehensile and chewing mouth-parts.

Between the consumer and the producer there probably is a middleman. The marine middlemen are surely the bacteria. True, salt is antithetic to them as a class, but it has not kept them out of the sea, where they have more than one rôle to play. Thus some are putrefactive, reducing the dead bodies of animals and plants to carbon dioxide, ammonia and the like, which may re-enter the field of life by forming food for algæ. Bacteria of this kind are the scavengers, making clean things out of the unclean; but there are others which play a subtler part, by changing the ammoniacal

nitrogen into nitrites, and others which continue the work by completing the oxidation into nitrates. Besides these, however, there are many denitrifying bacteria, which work the wrong way by reducing nitrates to nitrites, nitrites to ammonia, and ammonia to free nitrogen. Associated with this question of denitrification is the curious fact that the cold Polar waters are richer in plankton than the tropical seas; the reason of this is not quite obvious, but it may be because the higher temperature favours the action of denitrifying bacteria which, by flourishing abundantly, lessen the supply of available nitrogenous food for the phyto-plankton. An alternative view is that low temperatures slow the vital processes and increase the length of life, so that several generations of plankton organisms are living contemporaneously in the colder waters; possibly, both views are correct.

One has imaged producers, consumers, and middlemen in the economy of the ocean, but we must not push the analogy too far; thus, bivalves and their kind that feed on minute detritus or debris are ever making available, to creatures that eat them, supplies of energy which would otherwise be wasted. We know that plaice in some waters are very fond of lancelets which subsist on detritus particles, hence it follows that, in respect to the plaice, the lancelet is a producer or even a middleman. In whatever way we think of the facts, we see a never-ending cycle and true circulation of matter. The algæ find nourishment in the water that bathes them and, using chlorophyll to conjure the sunbeams, build up organic compounds from inorganic constituents. Eaten by animals, the vegetable proteins are raised to a still higher grade as animal proteins; but when the plant or animal dies the complex organic substances are broken down through the agency of bacteria into simpler forms once more, and some of these being utilized by plants may enter again into the circle of life. Next time the reader eats the cod, let him remember that the cod fed probably on a whiting and the whiting on the sprat, and that the sprat feeds on copepods, which again depend on peridinians and diatoms. Such are the incarnations of the sea, and so the world goes round.

II.

While at a Church service the other day, and while the creed was being recited, the thought was irrepressible how interesting it would be if, instead of repeating the formal words of the Church service, each person were to proclaim aloud the creed of his own mind and soul. One thought all this and one writes it now, in no spirit

of doubt or scorn of the beautiful words so familiar to us, but impelled by thoughts which suggested a spiritual exercise that many of us might well make an effort to do inwardly, and perhaps obtain some advantage. One realized how many might draw therefrom some measure of consolation, for the simple reason that the creed of the soul is not always the creed of the intellect; it is usually simpler and more satisfactory. If we analyse ourselves honestly, we cannot deny that we all inwardly repeat beliefs involuntarily and constantly. Even the least introspective among us hear a creed or belief resounding in our souls, often with surprise, sometimes with delight, occasionally with dismay. The situation seems to be, that the ceremonial of the soul permits of no interruption. If we think of our fellow-intimates we know and realize that, now and then conveyed by talk, by looks, by actions, or more often perhaps by that indescribable emanation of the character perceived both by long and sudden sympathy, we get to know the latent beliefs of other men. I may be expressing myself badly, but what one aims to bring into prominence is that in most of us there is a latent belief, which one calls the belief of the soul, not always consistent with the belief of our mind or intellect. Our intellect is peculiarly liable to the influence of pessimism, and very few of us can maintain a state of optimism by reliance upon the mind alone. By all experience, life is a tragedy, yet as our minds argue this out, within most of us there echoes an obverse platitude which whispers "It is all for the best." Our intellect is usually impatient of this inward belief, but by it our spirit or soul lives, and when we hear simple people or those whom we think simple people saying this, we ought to remember that they say it because they cannot help repeating aloud their latent creed, the creed of their soul.

This line of thought brings us to the problem of fatalism, which is one of the commonest beliefs of our minds. To some, this may seem a surprising statement, because they are imbued with the idea that fatalism belongs only to the East or to paganism. It is repellant to the religious-minded as, if pushed to its logical conclusion, fatalism denies the power of prayer, but it is reconcilable with reliance upon Divine protection. Fatalism has been closely allied with some forms of Christianity and, as an inner belief, dies hard; if any doubt it, let them think of the many who find the fears, which reflection and introspection raise, to be allayed by the instinctive assurance that "what will be, will be," and how the still small voice from within whispering the words "che sarà sarà" gives to us all a negative courage and perhaps a negative peace.

Conversely, one imagines many a Moslem brought up to use the Arabic equivalent of those words as part of his intellectual and religious faith, hearing other words prompted by his soul and, as he bows his head in the mosque, says in his heart that man really is master of his fate; if so, then his soul voices a theory which accords far better with the faith of the despised infidel than with his own. Of course, there are many men into whose souls the fatalistic belief does not enter, and there are others who, if they do uphold fatalism intellectually, mistrust it inwardly. These latter are not prepared to admit it, yet they do feel instinctively that the natural course of events can be interfered with or at least modified by personal effort.

As illustrating, further, the argument of this theme, one thinks of the very many who find it difficult to uphold by reasoned argument the efficacy of prayer for any but spiritual benefits. These people represent, typically, the diametric opposition between the belief of the mind or intellect and of the soul, because in every crisis of fear or perplexity they pray for benefits which are not spiritual. Again, one thinks of the many who have grave intellectual doubts as to the life after death, and yet one goes so far as to say that there are few of them who have not been frequently startled to hear the sounds of a creed which affirms it, being repeated in their souls. In these times of mourning the greater number feel for a few moments or hours the dear companionship of their dead; and, after all, what is it that they hear? as it were from within. Surely, if they put it into words, sounds very like "the life of the world to come"? The echo dies, and they realize how hard the old belief dies; also they know that this is not the last time that those words of the latent belief of their souls will be repeated as a small voice from within, and in spite of the oft-spoken words of their intellectual belief.

The net outcome of these reflections brings one to the conclusion that, in spite of the vaunted scepticism and fashionable materialism of the day, the majority of people are, at heart, more Christian than they think they are, and that that faith appeals far more to them on its spiritual and supernatural than on its moral side. To many who believe in their inmost consciousness or soul, however much they doubt in their minds, that a world of the spirit does exist where men do not see death, the Christian or biblical morality is repugnant. All this seems curiously painful and inexplicable, and yet one cannot avoid the conviction that some apparently groundless and inexplicable beliefs form at least sub-

sidiary clauses in the creed of most men's souls. We laugh at those pet beliefs, but in our inmost hearts we believe in them, and cannot escape from their constant repetition within the inner sanctuary of our thoughts. We cannot explain them, but we have to admit that they hold a place with that which is most vital. At this point we may be content to leave the subject, perhaps astonished to find that a thought, which originally promised to expose the baser side of our fellows, develops towards a realization that man, in spite of his intellectuality, is dominated largely by beliefs which are independent of his mind.

III.

In the preceding note one has laid stress on the word "within." It is worth while thinking out what pertains to the studied use of the word, as it involves a right understanding of the relations between externality and will. The influence of materialism makes many think of "within" as referring to that portion of space marked out by our bodies, and "without" as referring to the rest of space. If we think a little, we realize that this is an error. By the "within" is meant the region where our will is supreme, flowing only into thought and not into action, that is where the will meets with no opposition; this is tantamount to saying that "within" is the realm of imagination. On the other hand, the "without" means that region where the will, passing into action, meets with appreciated opposition, and is synonymous with the realm of Nature. Were it possible to remove the inertia of bodies, we can assume that the distinction between the "within" and the "without" would disappear; hence this distinction is not one of space. Moreover, we can discover pure will nowhere in man's body; we observe only many of its effects, just as we do in the world that lies outside of his body. Evidently, therefore, the spirit or "within" is not in space, since space, being an idea, can exist only in mind or spirit; and if space exists in spirit, spirit cannot exist in space. We are forced then to think that the external world is the product of a will not our own, and that fact constitutes its externality, and not any supposed spatial relations between it and ourselves.

We advance next to the realization that the reality of the ideas of our imagination is purely individual or subjective; thus, for the man who imagines money, that imaginary money is quite as good as so-called real money, but it will not satisfy his creditors because

their imaginations are not forming a like product. On the other hand, our sense-impressions are in the main objective. But, since all experience and knowledge exists only in mind, it is evidently subjective, and absolute objectivity is unthinkable. This difficulty, however, is overcome if we postulate a Divine or Supreme Mind, and we realize that what we call objective is really subjective, that is to say, existing in or subjective to the Supreme Mind. Of course, in thus thinking of the physical universe as an idea in the mind of the Supreme, one understands it as an idea which is willed forth, and Nature is nothing more than the externality of the Divine or Supreme. It is because of our likeness to the Supreme, that this real physical universe is possible to some extent to us as an ideal construction corresponding to the Divine ideal construction. The external world we know is the world as it exists in each of our minds, but the real external world is the world as it exists in the Supreme Mind, and in so far as our ideal constructions are like or approximate to the Supreme or Divine, do we know Reality. It follows, therefore, that all science and all efforts to interpret sense-impressions, by elimination of the errors of the individual, is an attempt to read rightly the thoughts of the Supreme Being. A difficulty suggests itself here: it is that however desirous one may be of believing in a God, may not this belief be regarded as an act of faith rather than as a product of reason? Reflection compels one, however, to say that the whole logic of experience absolutely forces us into the belief, and that we have more sure grounds for the belief in the existence of that infinite Will and Mind, which we call God, than we have for that of finite minds other than our own. Each of us in our daily life perceives motions, changes and constructions of ideas, which inform us there are certain particular agents like ourselves which are associated and concur with their production. Hence the knowledge we have of other minds or spirits is not immediate, as is the knowledge of our own ideas, but depending on the intervention of ideas, referred by us to agents, or minds or spirits distinct from ourselves. Now, though there are many things which convince us that human agents are concerned in producing them, yet it is evident to all of us that those things which we call the works of Nature are not produced by or dependent on the wills of men. We are compelled therefore to think that there is, though we cannot prove it, some other agent or spirit that causes them, and, from this line of thought, we get driven to the conclusion that this universal or master Mind, which we call God, is known as certainly and

immediately as any other mind or spirit which is distinct from ourselves.

But, it may be argued, some philosophers, notably Hume, have professed to disprove the existence of soul and spirit or mind, and reduced the individual to a mere series of separate sensations or phenomena. True, this claim has been made, but our sensations are governed by definite rules of order and sequence, called the laws of Nature, and also connected by the fact of memory. Just as the laws of Nature indicate the existence of God, so does memory indicate the existence of the individual spirit; and for this to be true it is not at all necessary that memory should be capable of recalling the whole past history of the individual, but merely that it should link together every moment of its consciousness with the immediately preceding one, so as to make it possible to trace out the above-mentioned sequence; and this memory always does. Further, the sense-impressions which I call "mine" are related to one another quite differently from the manner in which they are related to those called "yours"; this is because they are mine, and find their unity in one mind or spirit which is myself. Also, the fact that I have any idea at all is to me proof of my own existence as a mind or spirit and confirms Descartes' saying that, "I think, therefore I am." At this stage, further reflection raises the question, but if the individual spirit or mind can have an immediate knowledge of his own existence, not derived through ideas of sense, may it not be possible for him to have a like knowledge of other spirits or minds? One feels convinced that it can be possible, and the group of phenomena classed as telepathy are an example in point. In them we have the undoubted transmission of ideas from mind to mind, without the utilization of the known organs of sense. It is true that what are conveyed are ideas, but such ideas appear to be transmitted by a more interior way than that of physical sense; hence they are not ideas of sensation, though objectively true. It is difficult to withhold the opinion that they are the result of a direct perception by one mind of the ideas of another. Moreover, we may have notions of the relations between ideas. There are ideas which are, as it were, exterior and physical; there are others which are more interior or more spiritual. A man who is aware of his sensations may be said to know something of what one calls the externality of God; but how far more deeply into the knowledge of the Supreme Being has the man of science penetrated by knowing and appreciating the laws of Nature? Having once admitted the possibility of a scale of

discrete ideas, one feels amazed to think, or ask the question, who shall state where the process is to end?

Another thought obtrudes itself here; it is, that we cannot restrict the universe to the concept of it in mind. The possibilities of sense impressions far transcend the experiences of any individual. The first concept we form of reality is that derived from our sense-impressions, and the world around us is regarded as a real and permanent existence independent of mind. If we argue it out, our reason tells us that what we term the properties of matter are known to us only as sensations or percepts of our minds, and that we know really nothing of matter in itself; that is, nothing beyond the properties which we experience as sensations. Suppose we were deprived of some of these gateways of knowledge, say sight or touch; or, if other and more subtle senses were given us, how different would be our concept of the external world? Therefore, all we can assert is that external phenomena arouse a succession of mental states, and our present interpretation of those states may be only a little less fallacious than the erroneous interpretations we should give if we possessed but a single sensory organ. Clearly, our ideas of the world without us contract or expand in proportion to the extent of the means by which that world is perceived. Perception being impossible without a mind to perceive, mind is certainly the deeper reality, and Nature probably a mere construction or projection from our minds. From this point of view, Nature and ourselves are the appearance or vesture of the Supreme Mind, and the real world is the world of the Supreme Thought. Perhaps at this point one may be pardoned for expressing the reflection that Nature does not exist only in the thought of men, nor for the thought of any one man, nor by the united thoughts of all men, but it exists as the symbolical expression of the Supreme Thought, and is sustained perpetually by the Supreme Will. Against this view is the difficulty of explaining the independent existence and activity of the conscious self, for the self is not an idea nor an object of internal observation. One can explain it only by thinking the ego to be conscious of its activity only when that activity is opposed, or when effort is needed. We know that an effortless action arouses no consciousness, therefore effort lies at the root of consciousness, and behind the sense of effort in the ego lies impulse or desire. If so, then effort implies desire and opposition to that desire.

Whatever view we take, we seem compelled to admit that all our experience of phenomena is due to some form of action from

without upon our minds. The materialist says this action is due to things in themselves, and that the stream of consciousness within us accompanies the brain processes, much as a shadow accompanies an object in the sun; to such a man, Nature is as the curious, orderly marks on this printed page, the order, regularity and continuity of the printing being due to the interaction of the black marks among themselves, a chance collocation of atoms endowed with properties which have to be explained. Admittedly, one does not accept this, but rather thinks this ultimate reality to be mind, a Supreme Mind, of which our human minds give us a faint adumbration. Suppose we take the example of a printed page; we can read and understand the human thoughts expressed on that page, because we have something in common with the writer of the page, and that something is mind. The printed words do not enable us to see the author, nor do they in any way resemble him; but the printed signs are intelligible because our intelligence is related to his intelligence. And so the mental signs which the phenomena of Nature present to us are not the real world, for that, being the world of the Supreme Mind, is inaccessible to us. But those signs reveal order and purpose, and we can more or less imperfectly interpret those signs because they are an expression of an intelligence which is related to our intelligence, and can communicate with our minds. We see ourselves, therefore, as parts of a larger whole and we realize that that which is within each of us is the recognition, the development and the manifestation of the greater life within.

IV.

A newspaper paragraph arrested one's attention the other day It was to the effect that someone, I think Marconi, had perfected an instrument or means whereby people could see through some two or three feet of brick wall. In these days it would be rash to say or even think such an attainment is impossible, but the whimsicalities associated with the very suggestion of it were irresistible. The first thought was, shall we welcome any ability to look through solid walls? To most of us it will be of doubtful and embarrassing applicability, especially as it might be used for unworthy purposes, and, in the hands of degraded persons, be employed in a manner that we should condemn. If we are to be able to see through brick walls, it will be within practical politics to look round corners, and then surely our later state will be indeed worse than our first. Of

course, looking right through a wall is a more straightforward procedure than looking round a corner, but both suggest prying and spying. We doctors are all familiar with X-rays, and know how it is possible to see through a man's skin and flesh and look at the actual condition of his bones. Odd as it may seem, but I well recall a case when a man flatly refused to submit to the X-ray process on the plea that his bones and insides were private and not to be looked at by doctors or anyone else. True that was in the early days of that discovery, but it might find many echoes nowadays if we could walk about the streets using the X-rays and looking right into people.

Suppose we ever do come to be able to see through walls, let us hope that it will be incapable of being used in any free and easy manner, for if not, away goes all privacy. Many readers of this Journal are married, let such a reader think of himself at his club or perhaps dining *à deux* at a restaurant, when he wished it to be supposed that he was attending a meeting of some learned society. What would become of that sense of security which he has hitherto enjoyed if he knows that anyone, who wants to discover him, can look through the wall and see him *flagrante delicto?* One might give other examples which suggest not only domestic but other storms; the very thought raises many shudders.

The present-day efficiency of the telescope and field glass is notorious, and, though perhaps not going so far as to warrant a claim to read a letter at long range, still with a potential invention by which you can look through a two-foot thick brick wall in prospect the outlook is disturbing. We shall all have to write with invisible ink, and even that precaution would not provide a complete safeguard. To begin with, the use of invisible ink very properly arouses the suspicion of the authorities; but, apart from that, a message written in invisible ink cannot serve any purpose until the writing is made visible, and then, of course, the hypothetical danger is as great as ever. Undoubtedly there is much writing that would be better left invisible for all time, while some may urge that it would be better not to write at all, than to write that which can never be seen; but, as readers of this Journal know, some men have a mania for writing, apparently for the mere joy of the thing. Without being too pessimistic, one is unable to repress a fear that, if this reading through brick walls apparatus matures, some other restless inventor will scheme out an appliance by which men will be able to read each other's secret thoughts; truly, when that day comes, life will be made intolerable, tempered

only by the circumstance that everyone will, in self-defence, have to be sincere. Many of us have read the story of Judith Lee and her powers of lip-reading. If the world contains many more like her it will indeed be a case of not knowing where we are, because there will be little secrecy and certainly no privacy.

V.

On a recent railway journey, my only fellow-traveller for many miles was a citizen of the Great Republic. He was an interesting and much informed man, but one whose mentality was warped by the importance of wealth. In that respect he stood not alone in this world, but, after he had left the carriage, one could not help thinking over the mystery of wealth and the varied aspects suggested by the love of money. One recalled the cynical remark of Dr. Johnson, wherein he said that men are never more innocently employed than when they are making money. But he might, with equal truth, have added that they are never more naturally employed. To make money, or at least try to, and leave it to their children, is as natural to men as to make love and beget children; and it is safe to say that no force can prevent it.

In the eyes of some people the love of money is the root of all evil; certainly it is the root of some evil, but it can hardly be the root of all evil, for it is only one perverse passion out of many. There is, however, a kind of respectability about money which makes the love of it peculiarly insidious and dangerous, since it conceals from the lover the nature and effects of his passion. If a man wants too much food we call him greedy; if a woman wants too many clothes she is evidently vain; but money is not a thing like food or clothes, that can be enjoyed by itself; it is only a means of getting the things that can be enjoyed, consequently desire for money is really an indirect greed. We may regard it as a civilized means of conducting the struggle for existence, which to a great extent conceals from those who use money the ugliness of that struggle. Another way of regarding it is to call it a kind of diplomacy, politely conducted, behind which there is war; but the diplomats do not see the war. They deal only in documents, and they are not aware, except at second hand, what all those pieces of paper and the struggle about them mean to the mass of men. Most of us know one or more very rich men who are greedy for wealth, but it is doubtful whether those men are really greedy for all the things that money will buy. Although money keeps its

actual power and is prized for that, most of those wealthy men, in their own minds, divorce it from its real meaning. To them money is, or becomes, a mere symbol of something more romantic than it is; it inflames their imagination and the imagination of a great part of the poorer world too, as being or contributing a personal quality in the man who possesses it, and not merely a means of buying material things.

We all know that wealth can be used for great and noble purposes, but the man who is greedy for money does not usually want to use it for such purposes. More often than not, he does not want to buy an excessive number of material things; his greed has become abstract and is a desire for a symbol, quite forgetting what the symbol means. Further, this curious greed for a symbol spreads among people who are not otherwise greedy. The respectability of money wraps itself round them and conceals from them the character and results of their inordinate desire. They see only lists of securities, not heaps of gold; and even if they do quarrel about money with someone else, perhaps equally greedy for it, there is no open scrambling, but only a very decorously conducted lawsuit. All the winner knows is that he has got judgment in his favour, which means that he acquires a certain number of material things from his opponent. But it does not mean all that to him, but rather a kind of justification conveying to him a moral and legal right to own the money he gets through it.

These things are plainer to us in this time of war, because we now see greed for money as it really is, and we no longer reverence a rich man simply on account of his wealth and what he might do with it; we have other tests forced upon us. We judge a man for what he does, not for what he might do; that is, we value his personal qualities rather than his possessions. All our experiences tell us that a man may be poor, not because he is a weakling, but because he cares for other things than wealth. The question is, shall we all remember this when peace comes again? Though we know that so and so is a rich man, we must ever base our judgments of him by what he does rather than on what he has; and the great hindrance in so exercising our judgment is the reverence for money. The millionaire who amasses wealth for perhaps a posthumous charity is an inferior man to the simple soldier who gains a V.C. Of them, we may well say, "That low man seeks a little thing to do, sees it and does it; the high man, with a great thing to pursue, dies ere he knows it." The reverence for money hides from us our own avarice and the avarice of others; it spreads a fog of

respectability where there ought to be no obscurity at all; it makes us think there is peace where there is war.

One curious fact shows, further, that we do unconsciously reverence money more than the things we buy with it. Thus, you can give a man anything except money without affecting your relations with him. This suggests that money is more sacred than other kinds of material possessions; it is difficult to say why. Possibly, the reason is, that money differs from other possessions in that it is a means of getting them, and that while you have money you keep a power of choice, because you have not chosen. If so, then the stealing of money or the giving of money is a stealing or giving of a power of choice, and this power seems to us more sacred than any of the things that can be chosen. It is a curious attitude, but we reverence undoubtedly the man who has a great deal of this power, partly because he has not yet selected, and partly because he might select well, generously or, as we think, nobly. Unfortunately, the satisfaction of the thought is discounted by the conviction that the man who can ennoble money is not he who is greedy of it, and of the power of choice which it conveys, but he who cares very little for it. One has compared the struggle or greed for wealth to a war; in so thinking, it may do us all good by opening and keeping open our eyes to the nature of the other and material war.

VI.

The conversation at mess one evening drifted to the problem of the waste of manhood in the present war and how it will affect all the nations concerned for a considerable time afterwards. As might be expected, in such an assembly, many of the views and arguments expressed were crude and lacking a clear insight or knowledge of the facts, but the conversation was interesting, if only as an index of how non-medical people were thinking. Naturally, one took a prominent part in the discussion and, afterwards, could not help reflecting upon the subject. As the matter is one which concerns us intimately, it may be useful to others if one outlines the main theme as it presented itself.

We have to recognize that war, with all its horrors, does mankind one service, and that is, it brings them back to realities. It teaches us how thin is our veneer of civilization, and sometimes recalls us to a recollection of matters fundamental to the existence of the State. In primitive communities, even among savages, the care of the children of the clan is bound up with the question of

the defence of the whole tribe. The primitive ruler regards every child as a potential warrior or mother of warriors; hence, even in the rudest tribes, some attention is given to the subject, and even among races which practise infanticide the cruel custom is relaxed in time of war. So, to-day, we in the van of civilization find ourselves as a nation once more considering the old fundamental question from the primitive standpoint. War has awakened us to a need which has too long been neglected, the need of reducing our grievous infant mortality.

So far as Britain is concerned the chief effect of the war will be the depletion of the manhood of the upper and middle classes, because of the selective death-rate among officers. This fact does not involve the view that the future generation will be the children of stay-at-homes and slackers. That view leaves the mothers out of account, and though the men are being killed, the women are not. Of course, to a great extent, the nation must be replenished from the lower orders of society, but after all, that has been happening for a long time. The average number of children in the better families is two, whereas the average family of the casual labourer is six. To keep up the proportion of a particular class, probably an average of four is needed. It is incorrect to assume that a family of two will replace the parents, since allowance has to be made for non-marrying members of these families and the wastage from early deaths. The reasons for the small family system are not merely economic. They are partly physical, arising from the increasing sensitiveness to pain, and are found strongest among the well-to-do. So much has this movement of selfishness spread, that the upper middle classes have been dividing themselves in half since the late 'seventies, and the limitation of families has now reached some of the prosperous artizans. It is curious to observe how certain trades are affected; among some types of skilled workmen we can now look only for small families, whereas men in other occupations, such as miners, are still conspicuous for the full quiver.

Apart from the extension of neo-malthusianism and the false ethics which it postulates, the steady falling of our birth-rate and the impending rise in our death-rate give cause for serious reflection. To appreciate the gravity of the question, we need to realize that the fall in the death-rate, which for a number of years had sufficed to compensate for that in the birth-rate, has now ceased to do so, and it seems only too apparent that a period of definitely lower natural increases than those of even the recent past has commenced.

Since 1901, owing largely to an increased proportion of old people in the population as a result of the decreased birth-rate, the age constitution of the whole population has become definitely less favourable, and as this change progresses it will, to an increasing extent, tend to increase the crude death-rate, and so to diminish natural increase. One often wonders how many people realize how rapidly we are becoming a nation of old people. One is writing without reference to books, but speaking from a fairly accurate memory, it may be accepted as true that, in the decade ending 1911, the population of England and Wales increased by 11 per cent; the population over fifty, however, increased by nearly 21 per cent; this means that the elder people are increasing twice as fast as the whole population. The latest emigration rate is six per thousand, and if this continues with a present birth-rate of twenty-three per thousand, we only require a rise of three points in the death-rate to bring about a stationary population. These are both suggestive and serious facts and, at the present crisis in our history, nothing could be more disastrous than to ignore or soften their meaning; neither can we encourage the view that neo-malthusianism is beneficial to a country, nor that the practice has either scientific support or statistical evidence in its favour. Further, it is unfortunately true that in all our large cities there is an appalling waste of human life, as indicated by an infant mortality rate which shows that 13 per cent of children born die within the first year of life. Clearly the remedy is not to prevent children being born, but to provide a healthy environment for mothers, and to ensure that children are born and reared in wholesome surroundings. Whatever political party may be in power after this war, improvement of the health of the people must be regarded as the most urgent task of the future; apart from other important considerations, our national safety will demand it as compensation for the falling birth-rate. There seems no need for pessimism, but there is a need to look the facts in the face.

To those who may be alarmed about the future, one feels tempted to point out that the elimination of the better social stock is no new phenomenon. The upper classes have always died out, and they represent the best fighting stock. That has happened all through history; it happened during the Wars of the Roses, which practically wiped out the last of the Norman nobility. In the Middle Ages also many of the best intellects of the nation declined parental responsibilities, for they sought the study or the cloister. There is, however, one very important difference from the biological

standpoint between this war and previous wars. The losses of women and children will not be as great. Likewise, disease is so much under control that the mortality from that cause will reach nothing like the same proportion as in the wars of past generations. Further, we must remember that the women are just as capable of transmitting the valuable qualities of the race as the men. Some of the forecasts we have had presented concerning the problems likely to arise from the surplus of women after the War seem exaggerated; personally, one does not think we shall lose half a million men altogether. In all probability, we shall all be poorer after the War, but that may lessen luxury and selfishness, leading to a recovery in the birth-rate, since when people are poorer their families are larger. The question is, how far social tendencies, now prevalent, will continue when the War is over. The encouragement of early marriages and the re-casting of some social and legal ordinances, affecting the status of women, might have a stimulating effect on the birth-rate. These, then, have been one's thoughts; they may be neither profound nor very original, still they may be of use if only they arouse interest in what constitutes a serious and difficult problem for us as a nation. The flower of our manhood is being carried away on the tide of War; it is for us to see that the race continues quantitatively and qualitatively efficient for our imperial needs.

VII.

A perusal of the daily casualty lists and the noting of deaths, both at sea and on land, of intimate and valued friends raises many sad and serious reflections. Some recent personal incidents of the kind have prompted thoughts which may find an echo in the minds of others similarly circumstanced. War on the land leaves the havoc of its passage bitten into the face of the country. We can feel that the earth, mother-like, agonizes with us for a time, though her scars are far sooner healed than our own. It is the way of Nature to forget; she tells us plainly thereby that it is ours, not hers, to remember. Whether we all do remember, is doubtful; perhaps, only for a time. No matter if some do forget; those that do remember can surely ever feel that all those corners of foreign fields, where lie our honoured dead, are in their way so many bits of Britain. For does not that rich earth conceal a richer earth, or rather a dust which our own land bore, shaped and made aware? Surely so, and what is more, can we not think that somewhere in the eternal mind there beats a pulse or vibration which gives back

the thoughts by Britain given? I own that I think so myself, and get some consolation from it.

When we think of those who have met their end in the sea, the application of the same thought becomes more difficult, but should not be so. Our difficulties in respect of the sea and all it has taken lie surely in the fact that drowning by the ocean leaves no vestige upon the scene. We all feel the cold, unconquerable callousness of the sea, which can swallow up so much human life and agony, and yet a moment later lie calm and smiling beneath the sun. It is all so different from the land, whose green or brown waves surge more slowly and, as it seems to us, more mercifully over the scene of our tragedies than the crisp, laughing rollers that close over a "Goliath" or a "Majestic." The lesson Nature teaches here is, that it is ours, not hers, to remember and, curiously enough, sailors have the longest memories of their drowned friends and shipmates. There is more than this to take to heart. Are smooth aspects or smiling promises to lull our race to forgetfulness, once this War is over? Surely, the lesson of the soulless ocean will ever be before us. A day will come when we shall be asked to forgive and forget; but, if we are wise, we shall know that forgiveness is one thing and forgetting another. Even as the sea in a few minutes, and the soil in a season or so, wipes out the evidence of wrong and horror, so the mind of man yields, in due time, to the obliterative influence of Nature. But with the horrors of existing events before us, we must be careful, in so yielding, that we do not abandon too readily the heritage of thought which is our hard-won grip upon the fleeting skirts of Time. The memory of a warfare that knows no sacredness, that kills blindly for results at any cost of honour, and from a mere lust of frustrated dominance, will and must be cherished; not in rancour, but as a safeguard of the future. Even before forgiveness can be thought of, all the reparation that can then be given, alas too late, will be due to humanity and not to ourselves. These thoughts are not the spirit of the earth or land and still less so of the sea, but they are those of human nature betrayed. It is that betrayal which makes the events of our day not to be forgotten or sunk under placid waves with the first promise of clear skies. One writes in a moment of grief and horror, but desirous to see things in due perspective; surely, the true lesson from the sea and land, which cover and hold our dead, is that, before we accept peace, we must be sure that it is not the tropical calm that brews the morrow's storm, and that the perversion of a nation's soul is sunk for ever, not merely submerged.

VIII.

Present circumstances compel one to rise very early and, as a man who for the greater part of life has been accustomed to rise late, one is impressed with the curious new sense of well-being associated with the new habit, and the strange development of a love for the morning which carries with it a feeling of comradeship with birds and animals around. One is not going to write a homily on early rising, but, thinking this over, one is tempted to note how many of us are not only creatures of habit but also victims of certain prejudices in regard to time periods. How many of us enjoy the middle of the night? To most it is a time of anxiety or weariness and associated with a wish to be unconscious of it. Where sleep is concerned, one hour before midnight is supposed to be worth two after it, yet few of us feel that the hours before noon are worth double those which follow between then and midnight. Only a few feel a recurrent sense of pleasure which, to some, seldom fails to accompany their first consciousness of light. The awaking at dawn, to such persons, is as a restoration to life and power and thought, and is associated probably with an unconscious detestation of the dark. This pleasant sense of waking is held to be an index of good health, and most early risers eat a good breakfast. But this class of men are not usually genial or gregarious and, oddly enough, in spite of the cheery outlook with which they contemplate the coming day, their temperamental thermometer falls with the day, and by bedtime they look upon the world with other eyes. Then there is the converse class of man; he who loathes the dawn and, a veritable child of the sunset, is a churl at breakfast. As the day goes on, his fellow-creatures reconcile him to the world. We all know the type and how they want to sit up and put off the moment of going to bed. These people do not seem to care much for life for life's sake, but only for what it has to give. Representatives of these two classes of men live in mess with me now, and one is inclined to think that there is something more civilized and rather higher about the point of view of the man who wakes unhappy but ends his day by finding the world too interesting to leave at orthodox bedtime. That type is undoubtedly a bore and nuisance to the weary, but he is ever with us.

Then, again, there are our little weaknesses and prejudices about days of the week. How many can truly say that Friday is their lucky or favourite day on which to cut their nails or begin an enterprise? I recall a dame who was always called "Friday-

faced Jane," simply because she was sour-looking. Although the week is an arbitrary division of time, free of the subtle influence of the moon, yet most people have a favourite weekday. My wife, for instance, attaches great importance to Tuesday, but what the reason is I have never been able to find out. Few people express a preference for Monday, and generally that day has a bad name. Many have heard of the old joke about the second day in the week being kept as a fast after indiscretions in eating and drinking on the Sabbath. Even the clergy are wont to speak of feeling "Mondayish," as expressing the weariness and reaction following a hard day's series of services on the Sunday, and Kipling has described a headache as a Monday head. Possibly, the modern antipathy to a Monday has been emphasized for many by the circumstance that it is settling day for many household accounts and, to those who indulge in betting, the settling up with a bookmaker for the rash and unrealized anticipations of the previous week. Then there is Sunday itself; a time was when that day was dull to a degree and, even now, in some families marked by a "Friday-faced" gloom. For the many, any bitter gravity attaching to the Sunday belongs to the past, but to the thoughtful the hope exists that the reactionary tendency to liken it to other days has reached a limit. In the present day, it is a day of leisure and pleasure, tempered by opportunities for public worship which are free from any shadow of moral or other compulsion. It breaks the monotony of life for the working classes and undoubtedly exercises a democratic influence, for on that day we don our better clothes and think we all look alike. Again, there is the fact that the majority of people have a good dinner on the Sunday; one cannot help thinking that it might be better if the money, which goes in Sunday clothes and meals, went to improve the quality of some workaday garments or were spent on better daily dinners, but antagonistic to this common-sense view is the prevalent philosophy that it is preferable to be very comfortable sometimes than a little less uncomfortable always. To myself, as a Nature lover, the chief charm of a Sunday lies in the circumstance that the streets are less crowded and the atmosphere is clearer. What this latter fact means will be obvious to all who have lived in a manufacturing area.

Of the months, one's folk-lore knowledge is small, but hardly anyone likes January and very few people have a good word to say for November. Why it should be thought unlucky to marry in May is one of those conundrums yet to be solved. There are

a few people who tell one that they like winter better than summer. To me, they are eccentrics and comparable with those who never feel so happy as when they are sitting snug over the fire and a bitter blast raging outside; those are the type of people who cannot enjoy being at ease unless they are sure that they are more at ease than somebody else. Thinking of seasons makes one think of our own lifetime periods. When we were schoolboys the custom was to assure us that it was the happiest stage of our earthly existence. With a stiff piece of Greek construe staring one in the face, backed by the certain imposition of so many lines to write or memorize, or perhaps a birching if the task were badly done, even the cheeriest and most irresponsible of boys found it difficult to accept unreservedly such a dictum. What do some of us think now? I am not so sure but that some of us in our hearts do now think that, after all, boyhood was our best time. We really had no worries then and had given no hostages to fortune. The verdict in this case will depend largely on individual experiences; probably the greater number will be found to admit that middle age is the best time of life; certainly in calm weather. Unfortunately, the weather of middle age is seldom calm for long together. The summer of life too often resembles the summer of our homeland, and resolves itself into a few fine days and a thunderstorm, but, even so, we are bound to admit that the fine days are very pleasant, almost as pleasant as spring, and only marred by their paucity. Some old men assure us that old age is the happiest time of life; perhaps so, and we can but hope that our own old age may be in accord with that assurance. As to these uncertainties, it is no use worrying; the only thing to do is to do one's best, confident in the belief that the knowledge that one has played the game throughout will bring its own reward.

THE CARRIER PROBLEM AT HOME IN TIME OF WAR.

By EDWARD C. HORT, F.R.C.P.Edin.

With the consent of the Director-General of the Army Medical Service, I have prepared the following sketch of the efforts that have been made in the past year to deal with the carrier problem at home in the Addington Park War Hospital, in so far as it is concerned with the enteric group of diseases.

The original idea in starting this hospital was the provision of suitable accommodation in the country near London for soldiers suffering from acute infective disorders, such as enteric fever, dysentery, and septicæmia; and a vital part of the scheme was the provision of a well-equipped laboratory in which bacteriological examinations could be systematically carried out. In order to give effect to this scheme, three essentials had first to be secured by the Civilian Committee which had been called together for the purpose —the loan of suitable premises, the approval of the Director-General, and the necessary funds.

Subject to certain conditions designed to protect the interests of the legatees, the trustees of the Addington Park property generously placed the Palace and grounds at the disposal of the Committee for the purpose desired. The Director-General at once gave his cordial approval to the undertaking, and the entire cost of maintenance was guaranteed by the War Office, the cost of equipment of the hospital and laboratory being generously defrayed by private subscribers and by the Red Cross Society, on the recommendation, in the first place, of Sir Frederick Treves. Work was therefore at once set in hand, and the necessary staff appointed.

Before the opening of the hospital, however, in December, 1914, with accommodation for one hundred and thirty beds, the Committee were asked by the Director-General if, for the time being, they would consent to admit convalescents of the enteric group (enterics, paratyphoids, dysenterics) instead of acute cases, in order that a search for carriers, and the necessary detention, should be systematically carried out. And for this purpose they were further invited to assume responsibility for additional accommodation to the extent of two hundred beds in huts, the cost of erection, equipment, and maintenance being borne by the War Office.

The Committee without hesitation undertook the desired responsibility, and the Palace accommodation of one hundred and thirty beds was at once taken up by convalescents who were submitted to periodical tests for "carriage." In a few weeks the huts were also ready for occupation, and up to the present date a total number of three hundred and thirty resident convalescents, replaced at intervals by fresh arrivals, have been periodically examined.

In the early days of the War there was no justification for the provision of a much larger establishment than this to cope with possible emergencies. It was important, however, to make the existing accommodation as elastic as possible. Provisional arrangements were therefore made to use Addington as a clearing-house, with external provision for such convalescents as were proved to be innocent of "carriage" after repeated examinations over an average period of from six to eight weeks. This external provision included detention in secondary convalescent homes, where they were detained for a further period of some weeks, during which time the excreta were sent at stated intervals to the Addington laboratory for further examination. If still found to be free, patients were then discharged on furlough. No patients found to be carriers, whether convalescing or convalescent, were sent to these secondary houses. Under an Army Order true chronic carriers are eventually invalided out of the Army and return to their homes. The Medical Officer of Health of the district in which they reside is informed to this effect.

This arrangement of using Addington as a clearing-house, with the secondary convalescent homes as auxiliaries, still under bacteriological supervision, made it possible not only to examine a considerably larger number of cases than would otherwise have been feasible, but also to increase the total period of supervision. The total number that have been passed through Addington in this way is at present about two thousand; and in more recent months the work of the bacteriological department has been considerably increased by the examination of specimens from convalescents who, for one reason or another, have not been through Addington. On the other hand, the work has been greatly assisted by the co-operation of pathologists attached to various hospitals, as regards patients who have been kept under their observation till vacancies occurred at Addington. In all such cases, the search for carriers has been systematically carried out, and we have been regularly kept informed of the results.

The arrangement described, which was only made possible in

many instances by the generosity of private individuals who, in some cases, assumed the entire financial responsibility, and by the invaluable help given by Lady Dudley, as head of the Convalescent Home department of the British Red Cross Society, had, however, certain disadvantages, which were accentuated by the increasing demand for beds. In view of this increased demand, which itself necessitated centralization of existing convalescent homes in the public interest, the Director-General again invited and obtained the consent of the Committee to assume the responsibility for fresh extension in Addington Park. The proposal involved fresh hut accommodation for 350 more beds, in addition to the existing 330, of which, by an arrangement with the Australian Commonwealth, 150 were set aside for the reception of Australian convalescents, the Government of Australia paying for maintenance. In addition, the Director-General proposed that a military depôt should be established in Addington Park to admit one thousand patients, in order to replace the auxiliary convalescent homes hitherto relied on to clear the beds at Addington.

Arrangements, therefore, are now being made on these lines, with the result that in a short time the increased accommodation available, capable of yet further extension, will allow for the reception and detention of approximately 1,700 potential carriers, who will be replaced as fast as the exigencies of the War demand, compatible with safety to the general population.

Instructions based on these considerations and with particular regard to continuance of bacteriological supervision for as long a period as is practicable, have recently been issued by the Director-General.

The following is an abstract of these instructions :—

Acute cases from overseas to be sent direct to the Royal Victoria Hospital, Netley, or to the Military Hospital, Devonport.

Convalescents are to be transferred to Addington Park War Hospital, if accommodation is available. If accommodation is not available they must be sent to suitable auxiliary hospitals (Class B) —(formerly known as "Convalescent Homes")—for four weeks. If found to be free at the end of this time they will be granted furlough, and notifications will be issued to the proper authorities.

Acute cases occurring at home to be treated in isolation hospitals. Convalescents to be sent to Addington. If accommodation be not available there, they may be sent to one of the auxiliary hospitals attached to the hospital, provided they are proved at the time to be free. If carriers, they are to be sent to Addington as soon as fit to travel.

In no case must convalescents be pronounced as temporarily free until three negative examinations have been recorded at intervals of a week.

In all cases of transference to an auxiliary hospital, or of discharge to furlough, the Commandant at Addington must be at once informed, and a nominal roll of all cases, giving the date and address to which they have been dispatched, forwarded at the same time. A copy must also be sent to the War Office. Until the military depôt in Addington Park for the reception of 1,000 additional convalescents is ready for occupation convalescents to the number of 1,200 will be located in Woldingham Camp, and the excreta of these 1,200 will be periodically examined in the Addington laboratory.

The personnel of the medical and bacteriological staffs is as follows :—

Medical Staff.

Colonel H. J. W. Barrow, A.M.S., *Commandant.*
Sir John Broadbent, Bart., M.D., *Honorary Physician.*
Edward C. Hort, F.R.C.P.Edin., *Honorary Physician.*
W. J. J. Stewart, M.D., *Medical Superintedent.*
O. Polhill Turner, M.D., *House Physician.*

Bacteriological Staff.

Edward C. Hort, F.R.C.P.Edin., *Director.*
C. E. Lakin, M.D., *Assistant Director.*
T. H. C. Benians, F.R.C.S., *Assistant Bacteriologist.*
W. Collingwood, Esq., *Assistant Bacteriologist.*
Miss Delyell, M.D., *Assistant Bacteriologist.*

The medical and bacteriological staffs have lost through resignation the services of Dr. Williams and of Dr. Elizabeth Lepper.

For the information of those particularly interested in the subject, an outline of the routine adopted in the bacteriological laboratory at Addington is now given.

The results obtained will be issued in the form of a report to the War Office, to whom application will be made for permission to publish in the Journal of the Royal Army Medical Corps, at the end of the War, or possibly yearly, together with such deductions for future guidance in the carrier problem as appear to be justified after expert statistical analysis. They will then be handed over, in accordance with an undertaking given a year ago, to the Secretary of the Medical Research Committee, for incorporation, if his Committee so desires, with the medical history of the War.

It should perhaps here be added, that in the interests of the patients themselves, as well as of the local population, every reasonable precaution has been taken since the opening of the hospital to prevent the spread of infection through carriers, whether detected or not, by systematic bactericidal treatment of the excreta and linen. These precautions were adopted after consultation with the Principal Medical Officer of the Local Government Board and the Local Medical Officers of Health. In all cases the fæcal matter has been incinerated in a special form of destructor, the working of which has given excellent results. And the urine has been disinfected in special receptacles containing bactericidal fluid of proved efficiency in the dilutions employed relative to the time limit of exposure. In the case of linen suitable arrangements have been made for its disinfection. In future, owing to the larger numbers of cases requiring bacteriological supervision, the urine will be treated by the application of heat for sufficient periods to ensure destruction of non-spore-bearing organisms. In the hospital and in the huts the men are also instructed in such special methods of personal hygiene as are necessitated by the grouping together in one place of large numbers of convalescents from diseases of the enteric group.

Routine Employed at Addington in the Search for Carriers of the Enteric Group of Organisms.

The following scheme of identification of these organisms is one that I drew up a year ago for general use at Addington, with one or two alterations since added. It is collated from several sources, particularly from Ledingham and Arkwright's classical handbook on the carrier problem in disease, to which, as well as to Semple and Greig's well-known memoirs on the subject, I am also indebted for much valuable information on other aspects of this problem. For the additions to the scheme referred to I am indebted to Dr. Henderson Smith's admirable paper and chart published in the *British Medical Journal* a few weeks ago. In no case has any convalescent examined at Addington been labelled as a carrier unless the incriminated organism has fulfilled in all essential respects the details given in this table under its respective name.

To the list of organisms here given, for which systematic search is made, should be added the *M. melitensis*. The search for evidence of amœbic dysentery has not yet been made part of the routine.

IDENTIFICATION TABLE OF MEMBERS OF THE ENTERIC GROUP.

B. Typhosus (motile)	Paratyphoid group (motile)	Dysentery group (non-motile)
..	*B. paratyphosus* A	*B. Shiga-Kruse.*
— ..	*B. paratyphosus* B	*B. Flexner.*
..	*B. enteritidis* Gaertner ..	*B. Strong.*
— ..	*B. enteritidis* Aertryk	*B. Y of Hiss.*
— ..	(*B. Morgan* 1).	

Group Characteristics—

(Common also to *B. pestis*, the Pasteurellæ group, *B. pseudo-tuberculosis*, and to the Gram-negative cocci—*M. melitensis*, Gonococcus, *M. catarrhalis*, and the meningococcus of Weichselbaum.)

(1) Pleomorphic.
(2) Gram-negative.
(3) No liquefaction of gelatine.
(4) No production of indol.
(5) No clotting of milk.
(6) No action on lactose, saccharose (inulin, salicin, amygdalin).

Individual Characteristics—

(7) Produce alkalinity in milk, except *B. typhosus*, *B. paratyphosus* A and B. *Strong*, which produce acidity in milk.

(8) Ferment glucose, mannite, dulcite, sorbite, maltose, galactose, lævulose, as follows: –

B. typhosus and *B. strong* ..	Acid in all.
Paratyphoid group, except *B. Morgan*	Acid and gas in all.
B. Morgan 1	Acid and gas in glucose, galactose and lævulose only.
B. Shiga-Kruse	Acid in glucose, galactose and lævulose only.
B. Flexner	Acid in all but dulcite and sorbite.
B. Y of Hiss	Acid in all but dulcite, sorbite and maltose.

(9) Agglutination tests (absorption when necessary): use serum *Y* for *B. Y* and *B. Flexner*.

Exceptions to Group Characteristics—

(1) The gonococcus and the *M. catarrhalis* are not known to be pleomorphic.
(4) Indol is produced by *B. Morgan* 1, *B. Flexner*, *B. Y of Hiss*, and *B. Strong*.
(5) *B. Strong* clots milk late.
(6) *B. Strong* produces acid in saccharose.

Note.—Dulcite, sorbite, galactose, lævulose have been unobtainable in bulk owing to the War. Dulcitol is now being tested as a substitute for dulcite.

In the case of strains of organisms with which from cultural and biochemical reactions a positive serum reaction might reasonably be anticipated, but in which, nevertheless, only negative results have been met with, such strains are not at once rejected. On the contrary, whenever practicable, repeated subcultures are made, if necessary, for a period from seven to fourteen days, and serum tests are again applied before final rejection is recommended. The necessity for this, especially with urinary strains, appears to be generally admitted.

On the other hand, numerous aberrant strains have been met with, which one is not really justified always in rejecting as of no pathogenic importance, but which, under the stress of a strenuous routine, it has not been possible further to examine. Some such strains have been reserved for further study in the hope of the advent of less laborious days.

The *routine for fæcal examinations is as follows :—*

Once a week, if possible, each patient provides a specimen after purgation. Notwithstanding this precaution, the number of solid specimens is surprising. An emulsion is made of the fresh specimen in five cubic centimetres of sterile broth, inoculated with two large loopfuls of material. It is then allowed to stand one hour at room temperature, and a five-inch MacConkey plate is inoculated with a large loopful of the supernatant fluid. From this plate a second is inoculated without recharging, and both plates are then incubated at 37° C. for about eighteen hours. Whenever possible, the plates are warmed before inoculation in order to diminish the amount of condensation water, and to obtain larger colonies than can be obtained in the cold. It is absolutely essential that the surface of the medium when inoculated should be free of condensation water. This we ensure by pouring the medium into warm plates, which, when the medium is set, are dried at 37° C. for some hours.

If possible, in each case presenting colourless or orange-tinted colonies, these colonies are picked off and individually emulsified in lactose litmus peptone water. If after incubation for one night growth has occurred and there is no change of colour, milk, peptone water and the available sugars are inoculated from each lactose tube. If growth has not occurred, or if no change is noted in the lactose tubes, further incubation is allowed. The complete set of sugars is examined after a suitable period of incubation in order to determine the presence of late lactose fermenters and to reject them. The final examination is made in seven to eight days, and subcultures are then made from likely cultures, in order to apply the necessary serum tests on the following day.

Our experience with the actinic rays, recommended by Dreyer on account of their reputed selective inhibition of *B. coli*, has been disappointing, and their use has therefore been abandoned by us, as by other observers. It appears, in fact, to have been unsafe to assume that a laboratory culture will necessarily react in the same way as a culture direct from the fæces, though in the hands of one of us even the former did not yield the results expected. Our experience with Endo's medium, and with malachite green, has so

far not justified us in using either of these media as a routine optimum medium in preference to MacConkey's medium for fæcal examination, though we preserve an open mind as to the possible superiority of brilliant green and other synthetic media not yet fully tested. In the meanwhile, MacConkey's medium is the routine medium for fæcal work.

Before leaving the subject of fæcal examinations, it may be well to observe that we have deliberately chosen to make serum tests the end-point of identification methods, in order to carry out in each case the fullest investigation possible with a view to the study of strains that might prove to differ biochemically from type. In the investigation of acute cases such deliberation is impossible owing to the necessity for early diagnosis. Time in our work, however, is not the primary consideration. Moreover, a negative serum test early applied rather favours rejection of a strain that repeated subculture, the necessity for which has been indicated by biochemical orthodoxy, may eventually show, when a late serum test is applied, to have been only temporarily inagglutinable.

Routine for Urine Examination.

I have elsewhere shown that in the bacteriological examination of urine the time at which the urine is collected is of some importance. And this applies to hæmic infections of the urine in convalescing cases as well as to tract infections in convalescent cases. If, for example, urine be examined which has only recently traversed the renal filter, as in specimens passed during the day after a short interval, the number of pathogenic organisms present per cubic centimetre may be insufficient to allow of their survival when transferred to a solid laboratory medium. On the other hand, if the first specimen after a night's rest be examined, the number of pathogenic organisms present per cubic centimetre is often sufficiently great to survive transference to a laboratory medium.

In the former case, incubation in the bladder has been cut short, and in the latter case incubation in the bladder has been prolonged. Hence the difference in the results obtained.

In other words, the urine in many cases of pathogenic infection is an excellent medium for growth of the organism causing the infection, and I showed by a large number of observations, published in 1914, that by the simple device of incubating the urine in the laboratory for a night before inoculation of the laboratory medium selected as an index of infection, far better results can often be obtained than if this precaution be omitted.

We repeated these observations at Addington a year ago with a small number of urines suspected of containing members of the enteric group, and we found that, examined in this way, the percentage of ordinary carriers in a mixed population of inoculated and uninoculated typhoid convalescents was considerably higher than is commonly believed. This only applied, however, to the convalescing carrier within six weeks or so of his discharge from an enteric hospital, presumably because the degree of hæmic infection was slight, requiring incubation for its intensification. In the case of the convalescent or true chronic carrier with a tract infection, incubation in the laboratory appears to be unnecessary if incubation in the bladder be first allowed, presumably because the degree of tract infection—allowing of free discharge of pathogenic organisms —is considerable. As a routine method, therefore, all the specimens of urine at Addington are incubated, usually for forty-eight hours, in the laboratory before inoculation of the medium selected for picking off colonies. In all other respects, except selection of medium, the procedure of urinary examination and identification is the same as for fæcal examination.

As regards the optimum solid medium for isolation of urinary organisms, we are not yet satisfied. MacConkey's medium in the commonest form of urinary carrier, the convalescing carrier, is certainly too severe a medium, however suitable it may be for isolation from the convalescent or tract carrier. And the fact that the convalescing carrier is commoner than the convalescent carrier, makes this class potentially more dangerous, especially as by the ordinary routine method of examination, without preliminary incubation of his urine, he is more liable to be missed. Even, however, in the case of incubated urine a MacConkey plate will often show no colourless colonies, or even no growth at all, whereas some of the nasgar plates inoculated in parallel will show colonies of non-lactose-fermenting Gram-negative bacilli. For example, forty plates of MacConkey were inoculated from twenty samples of incubated urine, and the same number of nasgar plates were inoculated from the same urine at the same time, in parallel. No less than thirty per cent of the MacConkey plates showed no growth at all, even after prolonged incubation, whilst five per cent of the nasgar plates gave colonies which subsequently proved to be non-lactose fermenters, and all showed growth after one night's incubation. The last fact would suggest that a medium such as nasgar favours the growth of extraneous organisms to such an extent as to make it useless as an isolation medium of pathogenic organisms. In practice this is not the case, since colonies of

organisms of the coli-typhoid group are soon detected with a little experience. And fortunately lactose-fermenting coliform organisms are relatively rare in males convalescing from diseases of the enteric groups. The expense involved is no doubt a serious item. Experiments with agar plates and with casein agar plates have not yet proved satisfactory, and, to repeat, the question of the optimum isolation medium for urinary examination for our convalescents is still *sub judice*, as is also the question of the advisability of enriching the urine with albumen prior to incubation.

Serological Tests.

The routine method employed is macroscopical only. We have recently adopted Dreyer's suggestions of always incubating at 55° C., using his standard emulsions for all Widal reactions, and of using considerable volumes of diluted serum, bacterial emulsion and normal saline. The results so far obtained have been excellent. We do not find the drop method to be of sufficient accuracy for routine use on a large scale. In carrying out a reaction with *B. typhosus* we test the serum in triplicate against this organism, paratyphosus A and paratyphosus B, and we propose to employ Dreyer's method of curve-recording by multiple examinations at stated intervals. This procedure, of course, is not in our case so much for purposes of diagnosis as by a systematic investigation of large numbers of convalescents in terms of Widal's reaction, of obtaining some light on several interesting problems that have emerged from our work. One of these is the question of the effect of inoculation on "carriage" which, in the light of data we have already collected, appears to be favourable. Much further study, however, will be required before any definite statement can be made as to this. As regards Bordet-Durham reactions with strains of organisms isolated from convalescing and convalescent patients, we have used twenty-four hour emulsions heated at 58° C. for one hour. In all other respects the procedure is the same as in the case of Widal reactions. We do not find it necessary to check our macroscopical results by microscopy, because we are not aware that the latter procedure does more than intensify a well-marked end-result already obtained by macroscopy alone.

This, roughly, is an outline of the attempts being made at Addington to deal with the carrier problem, and it is only designed to indicate here in a general way what is being done. Unfortunately, the exigencies of the moment do not permit of a more elaborate statement, which must be reserved for our official report.

SOME EXPERIMENTS ON THE ANTIBODY PRODUCTION IN RABBITS WITH MIXED TYPHOID, PARATYPHOID, AND CHOLERA VACCINES.

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and
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These experiments were carried out with a view to obtaining a prophylactic vaccine against the paratyphoid fevers, and at the same time combining one or more vaccines, so that the number of inoculations necessary should be as few as possible.

This is especially necessary in the Service, and as long as the efficacy of the vaccines is not impaired the protection against the several diseases is likely to be increased, as men will submit to one course of inoculation whereas they are less likely to submit to two or three.

The vaccines used in this series of experiments were typhoid, paratyphoid A, paratyphoid B, given separately; mixed paratyphoid A and B; mixed typhoid, paratyphoids A and B; and mixed cholera and paratyphoids A and B. They were all inoculated subcutaneously. These combinations were chosen as most of the paratyphoid infections are occurring in the Near East. The men are inoculated against typhoid before they leave this country, and are inoculated against cholera after they leave.

Now the protection against typhoid after inoculation lasts from eighteen months to two years, while the protection afforded by cholera vaccine is lost at the end of six months or thereabouts. In the face of this fact it does not seem reasonable to mix these two vaccines together, and so this combination was not experimented on. Another reason for not combining these two is that it does not appear to be advisable to give cholera vaccine until the individual to whom it is being given is likely to be exposed to infection, on account of its short protective period. As the present typhoid vaccine was worked out on the lines of antibody production in animals, it was decided to carry out these experiments on the same lines.

Owing to want of time, due to the ordinary routine work of the vaccine department, somewhat fewer animals were used for the experiments than would have otherwise been the case. This fault was remedied to a certain extent by placing the tests for agglutinins in the 55° C. incubator for the first two hours; this no doubt accounts for the low agglutinin titre produced for *B. typhosus*, and

by adopting Klien's method for estimating the opsonic power of the various sera, the thermo-stabile opsonins only being taken into account was adopted for the same reason. Each vaccine or combination of vaccines was given to two rabbits, and this worked out at fourteen rabbits, which were divided into five groups.

The different sets of rabbits were chosen so that their weights and ages should be as far as possible equal. In each case they were given the same dose of the various vaccines all through the series of experiments. This dose was given not so much with the idea of raising a high antibody production as with the idea of obtaining comparable results from all the vaccines.

Group 1 consisted of six rabbits, two of which received a dose of typhoid vaccine, namely, one cubic centimetre containing 1,000 millions of *Bacillus typhosus*. Two received 500 millions of *B. paratyphosus* A and two 500 millions of *B. paratyphosus* B.

Group 2 consisted of two rabbits, each receiving one cubic centimetre of a mixed vaccine containing 500 millions of *B. paratyhosus* A and 500 millions of *B. paratyphosus* B.

Group 3 consisted of two rabbits, each of which received one cubic centimetre of a mixed vaccine containing 1,000 millions of *B. typhosus*, 500 millions of *B. paratyphosus* A, and 500 millions of *B. paratyphosus* B.

In Group 4 were two rabbits, each of which received one cubic centimetre of a mixed vaccine which contained 3,000 millions of *V. choleræ*, 500 millions of *B. paratyphosus* A and 500 millions of *B. paratyphosus* B.

Group 5 consisted of two control rabbits.

None of the rabbits suffered in any way from the effects of the inoculation.

Agglutinin Formation.

The serum of the pairs of rabbits was pooled, after being kept for twenty-four hours from the time of drawing off the blood.

The emulsion used throughout the experiments was the same in all cases, being a saline emulsion containing 2,000 millions of organisms per cubic centimetre. The agglutinin reactions were estimated by the sedimentation method, the following dilutions being used : 1 in 20, 1 in 40, 1 in 80, 1 in 100, 1 in 200, 1 in 400, 1 in 800, and 1 in 1,000.

The dilutions of sera and organisms were placed in the 55° C. incubator for two hours and finally read at the end of twenty-four hours. The agglutinin formation was first estimated on the fourth day after inoculation. At this time no agglutination was observed

in the sera of any of the rabbits in Group 1, i.e., in the rabbits receiving doses of the vaccines containing *B. typhosus*, *B. paratyphosus* A, and *B. paratyphosus* B, given separately. In Group 2 the serum gave a complete positive reaction with *B. paratyphosus* A in a dilution of 1 in 40 and an incomplete reaction in 1 in 80. With *B. paratyphosus* B there was only a trace of reaction in a dilution of 1 in 20.

Chart I.

	1—20	1—40	1—80	1—100	1—200	1—400	1—800	1—1,000	Remarks
Group I.									
B. typhosus—									
4th day ..	—	—	—	—	—	—	—	—	Two rabbits received 1,000 million *B. typhosus* (sera pooled).
7th ,, ..	+	+	—	—	—	—	—	—	—
11th ,, ..	+	—	—	—	—	—	—	—	—
16th ,, ..	*∓	—	—	—	—	—	—	—	* + 1—10.
25th ,, ..	—	—	—	—	—	—	—	—	—
B. paratyphosus "A"—									
4th day ..	—	—	—	—	—	—	—	—	Two rabbits received 500 million *B. para.* A (sera pooled).
7th ,, ..	++	++	++	+	—	—	—	—	—
11th ,, ..	++	±	—	—	—	—	—	—	—
16th ,, ..	++	—	—	—	—	—	—	—	—
25th ,, ..	±	—	—	—	—	—	—	—	—
B. paratyphosus "B"—									
4th day ..	—	—	—	—	—	—	—	—	Two rabbits received 500 million *B. para.* B (sera pooled).
7th ,, ..	++	+	—	—	—	—	—	—	—
11th ,, ..	—	—	—	—	—	—	—	—	—
16th ,, ..	—	—	—	—	—	—	—	—	—
25th ,, ..	—	—	—	—	—	—	—	—	—
Group II.									
B. paratyphosus "A"—									Two rabbits received— 500 million *B. para.* "A." *B. para.* "B." Total 1,000 million organisms (sera pooled).
4th day ..	+	+	±	—	—	—	—	—	
7th ,, ..	++	++	++	++	±	—	—	—	
11th ,, ..	++	++	++	+	—	—	—	—	
16th ,, ..	++	++	±	∓	—	—	—	—	
25th ,, ..	++	±	—	—	—	—	—	—	
B. paratyphosus "B"—									
4th day ..	∓	—	—	—	—	—	—	—	
7th ,, ..	++	++	±	±	—	—	—	—	
11th ,, ..	+	+	—	—	—	—	—	—	
16th ,, ..	±	±	—	—	—	—	—	—	
25th ,, ..	—	—	—	—	—	—	—	—	

CHART I. – *continued.*

	1—20	1—40	1—80	1—100	1—200	1—400	1—800	1—1,000	Remarks
GROUP III.									
B. typhosus—									
4th day ..	—	—	—	—	—	—	—	—	
7th ,, ..	++	++	±	±		—	—	—	
11th ,, ..	++	+	—	—	—	—	—	—	
16th ,, ..	+	±	—	—	—	—	—	—	
25th ,, ..	±	—	—	—	—	—	—	—	Two rabbits received— 1,000 million *B. typhosus*. 500 million *B. para.* "A." 500 million *B. para.* "B." Total 2,000 million organisms (sera pooled).
B. paratyphosus "A"—									
4th day ..	+	±	∓	—	—	—	—		
7th ,, ..	++	++	++	+	—	—	—	—	
11th ,, ..	++	++	++	+	—	—	—	—	
16th ,, ..	++	±	—	—	—	—	—	—	
25th ,, ..	+	—	—	—	—	—	—		
B. paratyphosus "B"—									
4th day ..	—	—		—	—	—	—	—	
7th ,, ..	±	—	—	—	—	—	—	—	
11th ,, ..	+	—	—	—	—	—	—	—	
16th ,, ..	±	—	—	—	—	—	—	—	
25th ,, ..	—	—	—	—	—	—	—	—	
GROUP IV.									
V. choleræ—									
4th day ..	+	±	—	—	—	—	—	—	
7th ,, ..	++	++	++	++	+	—	—	—	
11th ,, ..	++	++	++	++	++	+	±	—	
16th ,, ..	++	++	++	++	±	±	—	—	
25th ,, ..	++	++	+	±	—	—	—	—	Two rabbits received— 3,000 million *V. choleræ*. 500 million *B. para.* "A." 500 million *B. para.* "B." Total 4,000 million organisms (sera pooled).
B. paratyphosus "A"—									
4th day ..	+	+	∓	—	—	—	—	—	
7th ,, ..	++	++	++	++	∓	—	—	—	
11th ,, ..	++	++	++	++	—	—	—	—	
16th ,, ..	++	++	±	+	—	—	—	—	
25th ,, ..	++	±	—	—	—	—	—	—	
B. paratyphosus "B"—									
4th day ..	+	±	—	—	—	—	—	—	
7th ,, ..	++	++	+	±	—	—	—	—	
11th ,, ..	++	++	+	±	—	—	—	—	
16th ,, ..	++	+	±	—	—	—	—	—	
25th ,, ..	+	±	—	—	—	—	—	—	

CHART I.—Showing the doses of vaccine given in each of the groups, and the agglutination reactions observed on the various days of examination. ++ = a very marked complete agglutination. + = a complete agglutination. ± = an incomplete agglutination. ∓ = a trace of agglutination.

On this day in Group 3, negative reactions were obtained with *B. typhosus* and *B. paratyphosus* B, but a completely positive reaction occurred with *B. paratyphosus* A in a dilution of 1 in 20, incomplete in 1 in 40, and a trace in 1 in 80.

In Group 4, the reaction with *V. choleræ* was complete in a

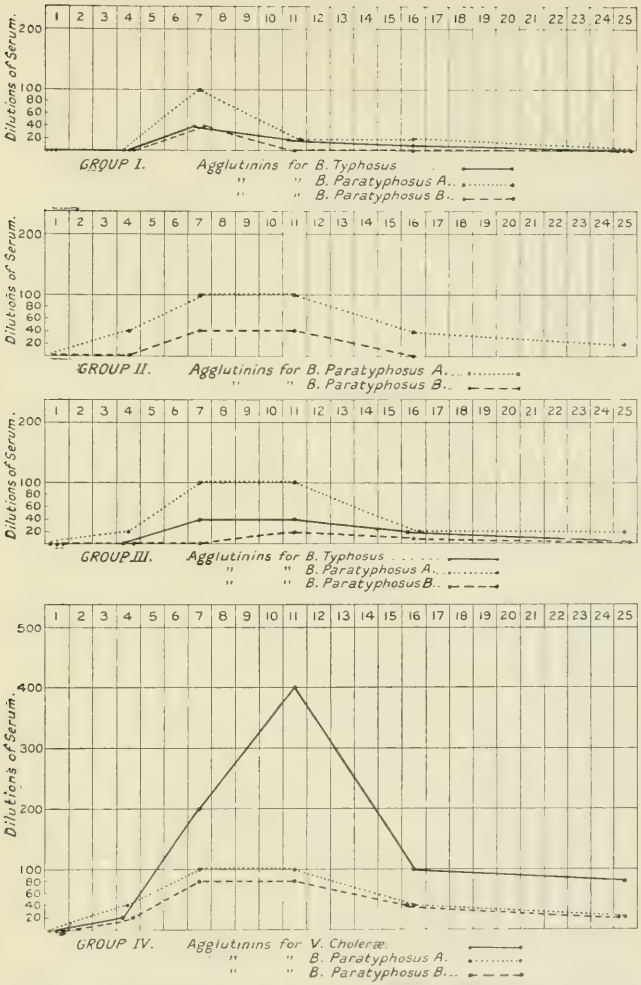

Dilutions of Serum.
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
200
100
80
60
40
20
GROUP I. Agglutinins for B. Typhosus
" " B. Paratyphosus A.
" " B. Paratyphosus B.
GROUP II. Agglutinins for B. Paratyphosus A.
" " B. Paratyphosus B.
GROUP III. Agglutinins for B. Typhosus
" " B. Paratyphosus A.
" " B. Paratyphosus B.
500
400
300
GROUP IV. Agglutinins for V. Choleræ.
" " B. Paratyphosus A.
" " B. Paratyphosus B.

CHART II.—Agglutination Curves. Group I represents curves obtained from the sera of rabbits to which vaccines of *B. typhosus*, *Para.* "A." and *Para.* "B" were given separately. Group II, to which a vaccine of *Paras.* "A" and "B" was given. Group III, to which a vaccine of *B. typhosus*, *Para.* "A," and *Para.* "B" was given. Group IV, to which a vaccine of *V. choleræ*, *Para.* "A," and *Para.* "B" was given. This chart is a graphic representation of Chart I, taking only the completely positive reactions into account. The divisions along the base-line represent days after inoculation.

dilution of 1 in 20, incomplete in 1 in 40. With *B. paratyphosus* A complete in 1 in 40, with a trace in 1 in 80. With *B. paratyphosus* B a complete positive reaction was obtained in a dilution of 1 in 20, incomplete in 1 in 40. Group 5 was negative in dilutions of 1 in 10 and 1 in 20, and remained so throughout the series of experiments. There is no chart shown for this group.

On the seventh day after inoculation it will be noted from Charts 1 and 2 that all the sera gave positive reactions in higher dilutions, except in Group 3 with *B. paratyphosus* B, in which no complete reaction could be demonstrated.

In both groups in which a vaccine against *B. typhosus* was given, the bacillus was agglutinated completely by the serum in dilutions of 1 in 40, i.e., in Groups 1 and 3.

A complete positive reaction was obtained with *B. paratyphosus* A in the case of sera from all groups in a dilution of 1 in 100; in Group 2 there was an incomplete reaction in a dilution of 1 in 200, and a trace was observed in this dilution with the serum from Group 4. With regard to *B. paratyphosus* B, there was a good deal of variation. In Group 1 a complete positive reaction was observed in a dilution of 1 in 40. In Group 2 the reaction was complete in the same dilution and incomplete in dilutions of 1 in 80 and 1 in 100. In Group 3 there was only a trace in 1 in 20, while in Group 4 the reaction was complete in 1 in 80, with an incomplete reaction in 1 in 100. In this group the *V. choleræ* was completely agglutinated by the serum in a dilution of 1 in 200.

Although rabbits inoculated against cholera alone were not included in these series of experiments, this formation of agglutinins corresponds with that obtained with the same dose of the same strains in a vaccine given some weeks ago to estimate the antibody formation in rabbits against cholera. On this, the seventh day, all the sera had reached their highest agglutinating point with the exception of the serum of Group 4, with the *V. choleræ*. The agglutinin production in this case continued to rise until the eleventh day, due, no doubt, to the large dose causing a slower rise to the maximum point. On this day the serum of Group 3 with *V. choleræ* showed a complete positive reaction in a dilution of 1 in 400 and an incomplete reaction in 1 in 800. With *B. paratyphosus* A and B the agglutinin reactions remained the same as on the seventh day as far as complete reaction results were concerned. The results obtained in Group 2 were the same as on the seventh day.

In Group 3, the serum with *B. paratyphosus* A gave the same

results as on the seventh day; the complete reaction to *B. typhosus* remained unchanged, and it agglutinated *B. paratyphosus* B completely in a dilution of 1 in 20.

In Group 1 the serum of all pairs of rabbits gave less marked reaction, and a negative result was obtained with *B. paratyphosus* B. On the sixteenth day a further fall of agglutinins had taken place. The highest positive reactions with *B. paratyphosus* A were found to be present in Groups 2 and 4. On this day with *B. paratyphosus* B the best result was obtained in Group 4, when a positive result was obtained in a dilution of 1 in 40, corresponding with that of *B. paratyphosus* A. In Group 3 a positive result was observed in a dilution of 1 in 10, and negative results were obtained in Groups 1 and 2. With *B. typhosus* a positive reading was obtained in a slightly higher dilution in Group 3 than in Group 2 (see charts 1 and 2). No further estimations were carried out until the twenty-fifth day after inoculation.

In Group 1 at this period no complete agglutination could be made out, except in the case of the rabbits inoculated against *B. paratyphosus* A, which gave a complete reaction in a dilution of 1 in 10.

In Group 2 agglutinins for *B. paratyphosus* B had been lost on the sixteenth day, while on the twenty-fifth day they were present for *B. paratyphosus* A in a dilution of 1 in 40. In Group 3, on this day, there was an incomplete reaction present with *B. typhosus* in a dilution of 1 in 20, but nothing complete. With *B. paratyphosus* A a positive (complete) reaction was present in 1 in 20.

In Group 4 the antibody production still remained the best. Complete positive reactions were obtained with *V. choleræ* in a dilution of 1 in 80, with *B. paratyphosus* A in 1 in 40, and with *B. paratyphosus* B in 1 in 20.

Group 5 (the control group) gave constantly negative results in 1 in 10 and 1 in 20 with all the strains of organisms used.

On reviewing this series of experiments as a whole it may be noted that the curves obtained from the agglutinin production in the serum of rabbits inoculated against *B. typhosus* alone and against *B. typhosus*, *B. paratyphosus* A, and *B. paratyphosus* B were very similar. In the case of the paratyphoids the result is not quite the same. The agglutinin production against *B. paratyphosus* A reached the same point on the same day in all the groups. It fell away most quickly in the case of Group 1, the remaining groups keeping at their highest point until the eleventh day, after which Group 3 fell away faster than Groups 2 and 4.

In the case of *B. paratyphosus* B agglutinins first appeared on the fourth day when the vaccine was given mixed with *B. paratyphosus* A and cholera vaccines. This group eventually gave the highest agglutinin production against *B. paratyphosus* B, and it was sustained for a longer period than in any other group.

Group 2 gave the next highest agglutinin production against this organism, and Group 3 the lowest, in which no agglutinins for *B. paratyphosus* B could be demonstrated until the eleventh day, and then a complete positive reaction was only obtained in a dilution of 1 in 20. The agglutinin production against *V. choleræ* was well marked and sustained. In this series no rabbits were immunized against cholera by giving a cholera vaccine by itself, but a rabbit which received the same dose of cholera vaccine some weeks ago was found at the time to give very much the same agglutinin production.

No group agglutinins could be demonstrated in any of the sera under examination, which fact is important in drawing conclusions from the experiments as a whole.

Opsonin Estimation.

The serum was heated at 56° C. for thirty minutes, and the thermo-stabile opsonins were estimated by Klien's method, the end-point being taken as 0·5 organism per cell. The emulsions of organisms used were standardized to contain 1,000 million per cubic centimetre. The mixture of sera, emulsions, and cells was kept at 37° C. for ten minutes only, so as to lessen the chance of any lysis taking place in the cells.

While opsonins were marked for *B. typhosus* and *V. choleræ*, they were present to a much less extent for *B. paratyphosus* B, and none could be demonstrated for *B. paratyphosus* A.

This difficulty in obtaining opsonins for *B. paratyphosus* A has also been recorded by Cummins and Cumming in the Journal of the Royal Army Medical Corps, vol. xix, No. 4, October, 1912, and vol. xxi, No. 3, September, 1913, the second reference being to the opsonin production in man.

In Group 2 no opsonins could be demonstrated for either *B. paratyphosus* A or B, so no chart for this group is shown.

In Groups 1 and 3 the opsonin production for *B. typhosus* is practically identical, the end-point on the seventh day being reached in a dilution of 1 in 144, that of Group 3 falling slightly sooner than that of Group 1.

In Group 4 the opsonic end-point for *B. paratyphosus* B was

CHART III.—Thermostabile Opsonins (Klien's Method). The groups are the same as in the agglutinin charts. No curve is shown for Group II as no thermostabile opsonins were demonstrable for this group. The end-point represents 0·5 organisms per cell.

reached in a dilution of 1 in 25 on the seventh day, and had fallen away by the sixteenth day, while the highest point for cholera was not reached until the eleventh day.

Our thanks are due to Major C. J. Coppinger for assistance in carrying out the opsonic and agglutination estimations.

Conclusions.

(1) Groups 2 and 4 give the best results as far as agglutinins go, while Groups 1 and 4 are the best with regard to opsonins.

(2) It must be noted that the dose of the individual vaccines is the same throughout the series of experiments, but in the case of the mixed vaccines the animal received at least double the number of bacilli, and in the case of Group 4 a total of 4,000 million organisms. This would tend to show that the increased antibody production is due rather to an increase of the mass dose than to group antibody elaboration.

(3) Inoculation with paratyphoid vaccines being quite in its infancy, there is no evidence yet obtainable as to the duration of the protection afforded, as the only real way to estimate this is from statistics obtained after inoculation has been adopted. This protection is probably of shorter duration, however, than is the case with typhoid vaccine, and this is an argument for not combining them together.

(4) From the experiments under review the best combination would appear to be that of cholera and the paratyphoid vaccines. It would seem reasonable to suggest that from the Service point of view, the inoculation against typhoid should not be interfered with, and that in districts where the paratyphoid fevers are prevalent a mixed paratyphoid vaccine should be used which, where necessary, may conveniently and advantageously be combined with cholera vaccine, thereby rendering fewer inoculations necessary.

(5) With mixed vaccines it is of utmost importance to keep up the dosage of the individual component parts. If, owing to excessive reaction produced, this cannot be done, the idea should be abandoned. Experiments with the same doses as given to the rabbits in this series are now being carried out in men.

ANALYSIS OF CASES OF TETANUS TREATED IN HOME MILITARY HOSPITALS FROM AUGUST, 1914, TO AUGUST, 1915.[1]

By Surgeon-General Sir DAVID BRUCE, C.B., F.R.S., F.R.C.P.

The object of this paper is to give medical officers serving in military hospitals at home the result of various methods of treatment in cases of tetanus.

In December, 1914, a return of cases of tetanus was called for from home military hospitals, and an Army form issued. Up to the present, notes on 231 cases have been sent in; of these, 98 recovered and 133 died. This gives a mortality of 57·7 per cent. In the "Memorandum on the Treatment of Injuries in War" (July, 1915)[2] it is reported from overseas that 179 cases of tetanus have been treated. Of these 179 cases, 140 died, a case mortality of 78·2 per cent.

The death-rate in untreated cases is stated to be 91 per cent. in those of short incubation, 50 per cent. in those of delayed incubation.

On examining the rate of mortality at the various hospitals where cases of tetanus have been treated, it is seen that at Netley it stands at 81 per cent. This is probably due to the fact that as this hospital is near the port of disembarkation the most serious cases and those already showing symptoms of tetanus would naturally be sent there.

There were six cases at Aldershot with six recoveries. As this result is very satisfactory, it may be useful to describe the method of treatment employed.

Cases of Tetanus treated at Aldershot.

Case 40.—The wound was in the right arm and caused by a shrapnel bullet. Five days after the wound, on his admission to Aldershot Hospital, he had 1,500 units of antitetanic serum injected subcutaneously as a preventive measure. Symptoms of tetanus occurred nine days after this injection, fourteen days after the date of wound. He now had 3,000 units injected subcutaneously and intrathecally on two days. Recovered.

Case 41.—Gunshot wound of middle finger of the left hand. On

[1] Reprinted from the *British Medical Journal*, October 23, 1915, p. 593, ii.

[2] *Brit. Med. Journ.*, August 21, 1915, p. 305.

TABLE I.—Particulars of the Six Cases treated at Aldershot.

Number of case	Date of wound	Prophylactic injection of serum.				Onset of symptoms			Curative treatment by antitetanic serum			
		Date	Number of days after wound	Method	Units	Date	Number of days after wound	Number of days after prophylactic	Date	Subcutaneously	Intrathecally	Result
40	1914 Oct. 18	1914 Oct. 23	5	Subcutaneously	1,500	1914 Nov. 1	14	9	1914 Nov. 2 Nov. 3	— 1,500	1,500 —	Recovered
41	Oct. 18	Oct. 23	5	Subcutaneously	1,500	Nov. 6	19	14	Nov. 6 Nov. 7	— 1,500	1,500 —	Recovered
42	Oct. 18	Oct. 23	5	Subcutaneously	1,500	Oct. 27	9	4	Oct. 27 Oct. 28 Oct. 28	— — —	1,500 1,500 1,500	Recovered
43	Oct. 26	Oct. 29	3	Subcutaneously	1,500	Nov. 5	10	7	Nov. 5	1,500	1,500	Recovered
44	Oct. 25	—	—	—	—	Oct. 31	6		Oct. 31 Nov. 1	— —	3,000 1,500	Recovered
45	Oct. 20	Nov. 2	13	Subcutaneously	1,500	Nov. 5	16	3	Nov. 5	1,500	1,500	Recovered

his admission to Aldershot Hospital he received 1,500 units as a preventive measure. Symptoms of tetanus occurred fourteen days after this injection and nineteen days after wound. Same treatment as in Case 40. Recovered.

Case 42.—Gunshot wound, scrotum and right thigh. He received 1,500 units on admission, five days after wound. Four days after this symptoms of tetanus appeared, and he received 4,500 units intrathecally in three doses on two days. Recovered.

Case 43.—Shell wound in left hip. On admission, three days after wound, 1,500 units were injected. Symptoms of tetanus appeared seven days after this injection, about ten days after the wound; 3,000 units subcutaneously and intrathecally. Recovered.

Case 44.—Gunshot wound, thorax. No preventive dose was given in this case on admission to the Aldershot Hospital. Symptoms of tetanus appeared six days after wound; 4,500 units in three doses, all intrathecally; 1,500 each, two on one day and one the day following. In addition, 2 c.cm. of a 25 per cent. solution of magnesium sulphate were injected into the spinal canal with each injection of serum. Recovered.

Case 45.—Gunshot wound of left hand. A preventive dose of 1,500 units was given on admission and thirteen days after wound. Symptoms three days after this injection and sixteen after wound; 3,000 units in one day subcutaneously and intrathecally. Recovered.

It may be that these cases were slight, and would have recovered spontaneously, but two things must be remarked. In five of the cases a prophylactic dose of serum was given immediately on admission to hospital at Aldershot, and in the curative treatment the direct injection into the spinal canal was always used. In England resort to this preventive use of serum seems to have been rare, and it is suggested that in suspicious cases it seems a sound line of treatment. After onset of symptoms the intrathecal way of approach appears also to be by far the most effective.

At Aberdeen there were three cases with three recoveries. None of these had a preventive dose on admission to the Aberdeen Hospital. One had 147,000 units (140,000 subcutaneously, 4,000 intravenously, and 3,000 intrathecally), another 18,000 units (16,500 subcutaneously, and 1,500 intrathecally), while the third had only 3,000 subcutaneously.

Colchester also had good results—7 cases with 5 recoveries. Here also there was no prophylactic treatment on admission, and nothing noteworthy in the manner of curative treatment.

THE DISTRIBUTION OF CASES OF TETANUS BETWEEN AUGUST, 1914, AND AUGUST, 1915.

The first cases occurred in August, 1914, and the following diagram represents as nearly as possible the number of cases which occurred in each month until the following July. It is impossible to show the proportion of cases of tetanus to the number of wounded, as the information is not at present obtainable.

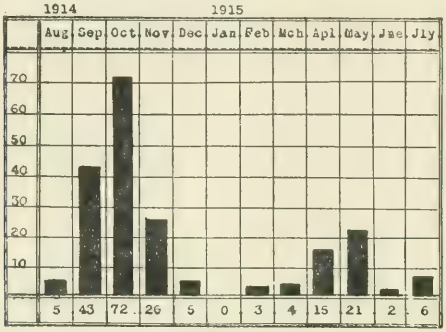


DIAGRAM I.

From Diagram I it will be seen that most of the cases occurred during September, October, and November, 1914. This may have been due to the fact that the wounded were more exposed to contamination of their wounds at that time, which included the retreat from Mons; that there was less opportunity of receiving surgical treatment as rapidly and as effectually as later on; that during this time the preventive use of antitetanic serum had not been developed, as it has during the last six months, when it is reported that, wherever possible, every wounded man has received a prophylactic dose; and generally that experience has taught medical officers how better to cope with the conditions obtaining in time of war, to unlearn the lessons of modern aseptic surgery, and to revert to the older methods of free incisions, thorough drainage, and constant removal of septic products by baths or irrigation.

At the present time it is impossible to say which of these factors has been the most important.

Relation of the Number of Days which elapsed between the Date of Wound and the Onset of Symptoms, and the Rate of Mortality.

It is well known that the rate of mortality depends on the length of time which has elapsed between the date of the wound and the onset of symptoms, and the following diagram shows that the cases of tetanus under consideration follow the same law.

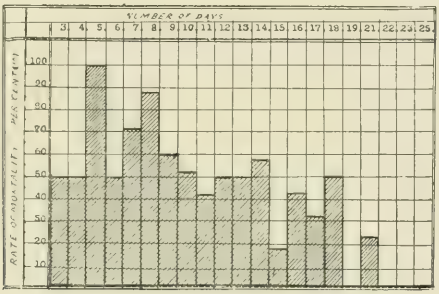
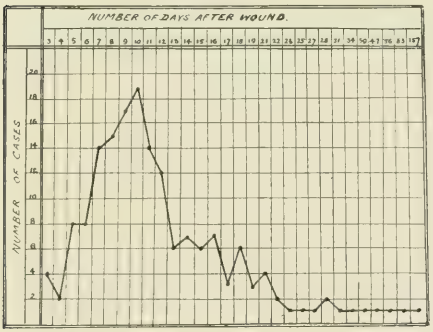


Diagram II.



Curve 1.

Diagram II shows that in the cases dealt with, if the symptoms of tetanus appeared within ten days of receiving the wound, the mortality was 66·6 per cent.; if between the eleventh and twenty-fifth day, 39 per cent.

The Incubation Period, or Number of days which elapse between the Date of Wound and the Onset of Tetanus Symptoms.—The preceding curve shows the number of cases which occurred on each day from the third day after date of wound.

From Curve 1 it will be seen that, in the cases of tetanus under consideration, more occur on the tenth day after the wound than on any other. The incubation period may be as short as three days and as long as 157.

Treatment of Tetanus by Antitetanic Serum.

A.—*Preventive Treatment.*

Among the 231 cases, only 37 are noted as having been treated with antitetanic serum before the onset of symptoms: 20 in France, 7 in England, 10 not specified. Of these 37, 18 recovered and 19 died, giving a mortality of 51·3 per cent.

The usual dose was 1,500 units (8 records), but 1,000 were given in 3, 500 in 2, and 4,000 in 2.

TABLE II.

		Recovered	Died
8 cases inoculated	on day of wound	3	5
3 ,, ,,	one day after wound	2	1
3 ,, ,,	two days after wound	2	1
2 ,, ,,	three days after wound	1	1
2 ,, ,,	five days after wound	1	1
3 ,, ,,	six days after wound	3	0
2 ,, ,,	seven days after wound	0	2
1 ,, ,,	eight days after wound	0	1
3 ,, ,,	nine days after wound	2	1
1 ,, ,,	eleven days after wound	1	0

9 cases were unaccounted for.

The average incubation period of 17 fatal cases was thirteen days; of 15 cases which recovered, 18·5 days.

B.—*Curative Treatment.*

Out of the total of 231 cases the numbers treated with antitetanic serum after the onset of symptoms was 215 (93 per cent.). Sixteen cases did not receive curative treatment with antitetanic serum in England. Of these, 3 recovered and 13 died; mortality, 81·25 per cent. Of the 3 which recovered all had been treated prophylactically in France. Of the 13 who died 6 had been treated prophylactically in France.

Of the 215 cases 116 were treated by subcutaneous injections alone; 46 recovered, 70 died. Mortality, 60·3 per cent.

Of the 215 cases 7 were treated by intravenous injections alone; 1 recovered 6 died. Mortality, 85·7 per cent.

Of the 215 cases 14 were treated by intrathecal injections alone; 8 recovered, 6 died. Mortality, 42·8 per cent.

Of the 215 cases 17 were treated subcutaneously and intravenously; 5 recovered, 12 died. Mortality, 70·9 per cent.

Of the 215 cases 41 were treated subcutaneously and intrathecally; 23 recovered, 18 died. Mortality, 43·9 per cent.

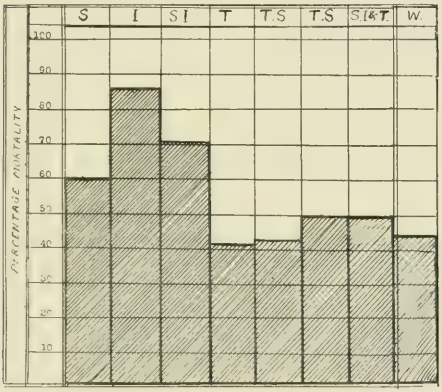


Diagram III.—Treatment of tetanus by antitetanic serum, showing rate of mortality in subcutaneous, intravenous, and intrathecal methods of injection. S., subcutaneous; I., intravenous; S.I., subcutaneous and intravenous; T., intrathecal; T.S., intrathecal and subcutaneous; S.I. & T., all three; W., intrathecal with or without others.

Of the 215 cases 2 were treated intravenously and intrathecally; 1 recovered, 1 died. Mortality, 50·0 per cent.

Of the 215 cases 16 were treated subcutaneously, intravenously, and intrathecally; 8 recovered, 8 died. Mortality, 50·0 per cent.

Of the 215 cases 73 were treated intrathecally with or without subcutaneous or intravenous injections; 40 recovered, 33 died. Mortality, 45·2 per cent.

It would appear from Diagram III, which represents this graphically, that injections of antitetanic serum into the spinal canal are more effective than subcutaneous or intravenous injections.

The Influence of Dosage on the Curative Action of Antitetanic Serum.—It is generally held at the present time that success in the treatment of tetanus by antitetanic serum depends on the use of big doses.

Out of the 231 cases under review, in 200 only was the amount of serum recorded. In analysing these 200 cases it must be noted that the amount of serum given is the total amount, not the daily amount or the amount of each dose. For example, if a serious case came into hospital, received 10,000 units, and died at the end of one day's treatment, this would be put down as 10,000, whereas a milder or more chronic case receiving the same treatment for ten days would be returned as having had 100,000 units. It would be false to argue that as the one got ten times as much serum as the other and recovered, the result was due to the larger amount of serum given.

In the returns sent in the daily amount is seldom given; what is recorded is the total amount given from the beginning to the end of treatment.

It is suggested that in the returns sent in in future the daily amounts should be specified, and the mode of injection, intrathecal or otherwise, carefully recorded.

Out of the 200 cases 4 received 1,000 units or under; 2 recovered, 2 died. Mortality, 50 per cent.

Out of the 200 cases 61 received from 1,001 to 5,000 units; 24 recovered, 37 died. Mortality, 60 per cent.

Out of the 200 cases 50 received from 5,001 to 10,000 units; 14 recovered, 36 died. Mortality, 72 per cent.

Out of the 200 cases 20 received from 10,001 to 15,000 units; 12 recovered, 8 died. Mortality, 40 per cent.

Out of the 200 cases 19 received from 15,001 to 20,000 units; 6 recovered, 13 died. Mortality, 68 per cent.

Out of the 200 cases 19 received from 20,001 to 30,000 units; 10 recovered, 9 died. Mortality, 47 per cent.

Out of the 200 cases 14 received from 30,001 to 40,000 units; 9 recovered, 5 died. Mortality, 36 per cent.

Out of the 200 cases 13 received from 40,001 to 147,000 units; 9 recovered, 4 died. Mortality, 38 per cent.

The main conclusion to be drawn from a study of these cases of tetanus treated therapeutically by antitetanic serum is that it seems highly probable that the serum has little or no effect on the course of the disease. There is a little evidence that, if the serum has any effect at all, then the intrathecal method of injection is the most effective. It hence arises that, if serum is to be used at all, then it

should first and foremost be injected intrathecally in as large a dose as possible, and repeated as often as safe and practicable, as long as symptoms persist. If there is any likelihood that tetanus toxin is still being absorbed into the blood-stream from the wound, then, in addition to the intrathecal injection, a further quantity of serum may be introduced intravenously and subcutaneously. In this way 3,000 to 5,000 units could be injected into the spinal canal and 10,000 to 20,000 into a vein and under the skin.

On account, doubtless, of the ease of giving serum by subcutaneous injection, this method is most used. In 116 cases out of the 215 under consideration (54 per cent.) it was the only method used. In 190 cases (88 per cent.) it was one of the methods used. The intrathecal method was only used in 73 cases out of the 215 (33 per cent.).

Now the contention is that the intrathecal path should be used in every case where serum is used, either alone or in conjunction with the other methods.

Other Therapeutic Remedies.

(1) *Carbolic Acid Injections.*

The treatment of tetanus by carbolic acid injections was described by Baccelli in 1888, and consists of the subcutaneous or intramuscular injection of carbolic acid. It is generally used in a 1 in 20 solution, and from 3 gr. to 12 gr. of the acid constitute a daily dose.

In the present series 33 cases were treated by this drug; 12 patients recovered and 21 died (63.6 per cent.).

In Table III the single injections and daily quantities are expressed in grains of carbolic acid. The cases are arranged according to the amount of carbolic acid given per diem, from 0·45 gr. in Case 75 to 80 gr. daily in Case 206.

From a study of the table it would appear that there is no evidence that carbolic acid has any favourable therapeutic effect on cases of tetanus. It is also suggested that small doses, such as ½ gr. a day, are quite inadequate.

Case 206 received altogether 900 gr. of carbolic acid subcutaneously during a period of twenty-one days. The strength of the solution was 2 per cent. He received 10 gr. every three hours for forty-eight hours, every four hours for ninety-six hours, and every six hours for forty-eight hours; then 20 gr. every twelve hours for nine days, and afterwards every twenty-four hours for three days. At no time were there any symptoms of carbolic acid poisoning. In addition, he had chloral and bromide by the rectum three times

a day, the effect of which was augmented by hypodermic injections of heroin and morphine whenever he was restless. The longest general spasm lasted for about two hours, but throughout the course of the illness the spasms were always well under control; the last occurred fourteen days later than the first. The patient developed tetanus six months after the date of wounding. No focus of infection was discovered.

TABLE III.

No. of case	Single dose, in grains	Quantity per diem, in grains	Total quantity injected	Recovered or died
75	0·45	0·45	2·25 gr. in 5 days	R
92	0·2	0·6	1·2 gr. in 2 days	D
214	0·22	5·2	?	D
51	0·9	5·4	5·4 gr. in 1 day	R
219	0·9	7·2	27·0 gr. in 4 days	D
10	2·6	7·8	?	D
14	0·7	8·4	94·5 gr. in 18 days	R
20	0·75	9·0	18·0 gr. in 2 days	D
223	0·9	10·8	42·0 gr. in 3 days	D
13	1·0	12·0	?	R
229	1·1	13·2	26·0 gr. in 2 days	D
231	2·25	13·5	108·0 gr. in 14 days	R
155	1·35	16·2	24·0 gr. in 1½ days	D
6	1·5	18·0	?	R
9	0·75	18·0	75·0 gr. in 4 days	D
46	0·75	18·0	144·0 gr. in 18 days	R
47	0·75	18·0	?	R
48	0·75	18·0	?	R
50	0·75	18·0	93·0 gr. in 5 days	D
164	1·5	18·0	?	R
225	1·5	18·0	36·0 gr. in 4 days	D
228	1·5	18·0	20·0 gr. in 1½ days	D
16	1·0	24·0	72·0 gr. in 3 days	D
216	1·5	36·0	88·5 gr. in 4 days	D
206	10·0	80·0	900·0 gr. in 21 days	R

(2) *Magnesium Sulphate.*

This method of treatment seems to have been first used in America, and its value depends on its powerful sedative or anæsthetic action on the spinal cord. Few of the cases under treatment in England have received this treatment. One case was given 2 c.cm. of a 25 per cent. solution intrathecally; another, one injection (amount and strength not given) subcutaneously; another received 2 c.cm. of a 25 per cent. solution with each dose of serum intrathecally. Three doses were given, and the patient recovered. Two cases received intrathecal injections, one of them 7 c.cm. of a 25 per cent. solution. In other cases it was given by the mouth and by the rectum, but in these it could not have been intended to

exert its action on the spinal cord. Nine cases in all were treated with magnesium sulphate ; of these seven died and two recovered.

It would appear that this method of treatment is powerful and not without danger, so that great caution ought to be used in its exhibition. Stromeyer treated five cases, giving an injection of 8 c.cm. of a 15 per cent. solution. In two of these there was marked anæsthesia of the trunk and lower extremities ; in the other three no anæsthesia was noted. In all five cases after the injection there was a cessation of the spasms and muscular rigidity, the patient slept, and respiration was slowed.

Conclusions.

The conclusions to be arrived at by this analysis are as follows :—

(1) In the 231 cases of tetanus under review the mortality was 57·7 per cent.

(2) Cases with a short incubation were more fatal than those of longer incubation.

(3) Most cases occurred on the tenth day after the wound.

(4) There are few allusions to the use of antitetanic serum as a prophylactic.

(5) In regard to the therapeutic effect of antitetanic serum, the evidence would go to show that this action is not well marked.

(6) If antitetanic serum is used—and in such a fatal disease it would seem wrong not to give the patient the benefit, even if doubtful, of the antitoxin—it ought to be injected in the first place intrathecally, as this method would seem to possess advantages over the intravenous and subcutaneous methods.

(7) There is no evidence that any benefit accrued to the cases treated by carbolic acid or magnesium sulphate injections.

(8) To sum up, the treatment of a case of tetanus might be as follows :—

(*a*) Place in a quiet, darkened room under care of a sympathetic and capable nurse.

(*b*) The best surgical treatment of the wound should be thoroughly carried out to ensure the prompt and complete removal of all septic products.

(*c*) The intrathecal injection of at least 3,000 units of antitetanic serum. At the same time 10,000 to 20,000 units may be injected intravenously and subcutaneously. This procedure to be repeated as frequently as the course of the disease seems to demand.

(*d*) In addition to this the patient should receive sedative drugs, such as chloral or chloretone, in full doses.

REPORT ON CEREBROSPINAL MENINGITIS OCCURRING IN THE DORSET MILITARY AREA (EXTENDING FROM CHRISTCHURCH TO TAUNTON) DURING THE PERIOD MARCH TO JULY, 1915.

By Lieutenant ARTHUR COMPTON.
Royal Army Medical Corps.

This report is written on the lines suggested by the Medical Research Committee, most of the headings being taken *verbatim* from the circular issued for guidance by the War Office. Some of the headings, however, have not been dealt with, because through insufficient observations and records I have not felt competent to deal with them. These are the influence in connexion with the mode of spread of the disease of: Particular circumstances of exposure; overcrowding or other hygienic conditions; fatigue; length of service in Army; catarrh as a predisposing factor.

1.—Mode of Spread of the Disease.

General Weather Conditions in relation to the Occurrence of Cases of Cerebrospinal Fever.

In fig. 1 three curves are set forth showing the sunshine, the difference between the maximum and the minimum temperatures expressed as a ratio of the maximum temperature, and the relative humidity of the atmosphere at Weymouth (see Appendix III) daily, from March to June, the four consecutive months when the epidemic of cerebrospinal meningitis of 1914-15 was at its height in this area. On the figure will be found marked the names of all cases of cerebrospinal meningitis, diagnosed bacteriologically, which occurred in Weymouth during the period, sixteen cases, military and civil (including the doubtful case "N."), on a total population of approximately 45,000. These names have been placed opposite the probable date of onset of the disease, in so far as it has been possible to determine this (see Appendix II).

Consider, first, the relative humidity curve of fig. 1. Only a superficial glance at this curve is required to recognize a remarkable coincidence: namely, whenever the curve passes, in a general way, through a maximum value, the occurrence of a case of cerebrospinal meningitis in Weymouth, or its environs, is almost invariably an attendant phenomenon. If this is no mere coincidence, it

indicates that the occurrence of any sudden increase in the degree of saturation of the atmosphere by water vapour may be an etiological factor of no small importance in determining an outbreak of the disease.

For the period in question, the agreement is so striking that could such a curve have been consulted beforehand it would have been possible to predict, almost to a day, the dates when cases of the disease should make their appearance. Some of the cases are of particular interest: "G.," for instance, arrived at the Isolation

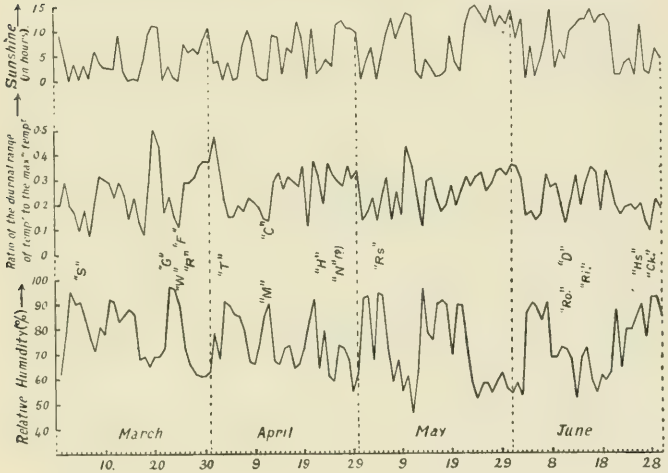


FIG. 1.

Hospital as a suspected case on March 24, with the history of a sudden onset. In his case the onset of the disease can be fixed almost to a certainty as March 23, the date when the highest reading of relative humidity for the months in question was recorded. In G.'s case it is stated that he suffered from a sore throat on March 22 (see Appendix II). Assuming this to be correct—that it was not March 23—and that the throat condition *was due* to the meningococcus, the question arises whether he would still have developed the disease had the sudden degree of saturation of the

air with water vapour which occurred between March 22 and March 23 not taken place. Unfortunately that question cannot be answered; but, if it could, the answer would be instructive. In or about this same date, "W.," "F.," and "R." are to be placed (see Appendix II).

This constant appearance of cases synchronous with a high degree of saturation of the air with water vapour seems to me to occur too frequently *in the above curve* to be a mere chance phenomenon; saturation of the atmosphere with water vapour would appear, therefore, to be a predisposing factor in connexion with outbreaks of the disease, *when the microbe is about.*

The finding is of interest in connexion with an old laboratory observation, namely, that the microbe grows best on solid media only when an abundant supply of moisture is provided; in fact, when the atmospheric conditions inside the culture tube are those of more or less complete saturation with water vapour.

But, in the case of the microbe growing inside the culture tube, another important factor plays a rôle—the temperature of incubation. Assuming that the disease is air-borne, the same should hold true for meningococci floating about in the air, whence they reach the nasopharynx of the susceptible individual, who, under suitable conditions—which it is important to determine—develops the disease. For if the microbe is not present in the air it obviously does not much matter what the conditions of relative humidity and temperature are, as factors to be considered in attempting to explain the occurrence, at any particular season, of cases of the disease.

Consider, in the second place, then, the variations of atmospheric temperature to which the microbe has been subjected during the period in question, by reference to the temperature curve reproduced in fig. 1. This curve expresses for any given day the difference between the maximum and minimum temperatures as a fraction of the maximum temperature.[1]

---

[1] Calling the maximum temperature a and the minimum temperature b, the ordinate of the curve is (a-b) /a, i.e., 1-b/ a; which means that each ordinate is a modified expression of the ratio of the minimum temperature to the maximum temperature. The ordinates have been calculated on this principle to facilitate comparison of the temperature curve with the relative humidity curve; thus, when the maximum and minimum temperatures for any given day are nearly equal, the temperature curve passes through a minimum value. If, on the other hand, the simple ratio of the minimum to the maximum temperature had been taken as ordinate the curve would pass through a maximum value whenever these were nearly equal, and such a curve would hardly show up so well on fig. 1.

On reference to this curve a striking coincidence will again be noticed. Cases of the disease make their appearance generally in connexion with minimum readings on the temperature curve; i.e., when the maximum and minimum temperatures are not widely separated, or, in other words, when equable conditions of temperature exist. Equable conditions are, no doubt, favourable to the survival of the microbe in the air; and possibly to its multiplication there. As no cases occur in connexion with maximum points on the curve, wide variations between the maximum and minimum temperatures may reasonably be looked upon as either unfavourable to the life of the microbe in the air, or favourable to its attenuation.

The cosmic factors, then, which would seem to determine outbreaks of the disease—the microbe being about—appear to be sudden saturation of the atmosphere by water vapour, combined with equable conditions of temperature.

In view of this hypothesis, all general maxima on the relative humidity curve and minima on the temperature curve, which are not characterized by the occurrence of cases of the disease, and which might, therefore, at first sight, appear as exceptions to the general rule, are worthy of attention.

Consider in this connexion, first, the general maximum through which the relative humidity curve passes between March 10 and March 16, which, on reference to fig. 1, is seen not to be characterized by any cases of cerebrospinal fever. The temperature curve during this period passes through a maximum value, which indicates that the atmospheric temperature at Weymouth during the period was far from equable, and consequently that the microbe was either entirely absent from the air or present only in an attenuated form. Thus, the hypothesis explains why no cases of the disease occurred in Weymouth at the time. Again, a similar explanation is forthcoming to explain another apparent exception: why no cases should occur to mark the general maximum on the relative humidity curve through which the latter passes between May 12 and May 21. During this period the temperature curve passes—except for the sharp minimum occurring on May 13—in a general way from one maximum value to another, through a comparatively high level minimum. This minimum probably did not correspond to temperature conditions sufficiently equable, which its high level would indicate, to permit of the microbe taking advantage of the generally favourable relative humidity conditions existing at the time. Hence, one finds no cases.

But a word of caution is necessary here. In estimating the force of maxima and minima on the temperature curve it should be noticed that general maxima do not appear, as a rule, to be so important in preventing outbreaks of the disease, as sharp minima —occurring even within general maxima—are in determining the same. A case in point is the general maximum through which the temperature curve passes between April 14 and April 30. This maximum is broken by two sharp minima, corresponding to April 20 and April 23 respectively; and one of these, the latter, is characterized by the case "H." Again, another instance of the same thing is seen in connexion with the case "Ri." This man took ill (see Appendix) on June 14: a date which corresponds to a sharp minimum on the temperature curve, although the general tendency of the curve at the time is upwards, proceeding to the general maximum ultimately attained on June 16.

Only one other important apparent exception on the relative humidity curve remains to be considered: that of the first week of June. And here, again, a simple explanation is forthcoming. Immediately preceding the maximum in question, it will be noticed that the air had for a long period been relatively dry, and the temperature far from equable. According to our hypothesis the meningococcus under these circumstances may be assumed to have disappeared from circulation in the neighbourhood, or, at least, to have become so attenuated as to be non-virulent. Probably the former, for when favourable conditions of humidity and temperature ultimately reappeared, during the first week of June, no cases of cerebrospinal meningitis in Weymouth made their appearance. And yet, only a few days later we find two cases, "D." and "Ro.," and that in connexion with a much less important maximum on the relative humidity curve. How is this to be accounted for? Obviously, by a return of the microbe in a virulent form to the neighbourhood; to explain which either a "carrier" or the wind may be invoked. It is of some moment that both explanations can be supported by fact. The number of "carriers," for instance, found in the district during the month of June was less than that of the other months covered by fig. 1; the laboratory statistics (see Table IV) show only half as many "carriers" for June as for each of the three preceding months. As for the wind, it is of interest that during the first week of June it came chiefly from the west and the north-west, i.e., from the interior of the country, where we know the disease existed at the time; whereas during the dry period which preceded this the prevailing winds were from the sea. It

is easy to imagine how the arrival of air-borne meningococci in Weymouth at such a time, when the cosmic conditions for them were so favourable, would rapidly lead to a reinfection of the neighbourhood. Thus, "D." and "Ro.," appearing as they do, in connexion with a well-marked minimum on the temperature curve and a transitory maximum on the relative humidity curve, may easily be accounted for. "Ri.," also, occurring as a case only a few days later, although in connexion with a comparatively low level, but otherwise definite maximum on the relative humidity curve, is not surprising.

Thus, all apparent exceptions, from the point of view of one or other curve, when inquired into, are found to support and strengthen the hypothesis rather than detract from it.

To repeat, then, the cosmic factors which apparently determine outbreaks of cerebrospinal meningitis, the meningococcus being about, seem to be sudden saturation of the atmosphere by water vapour, combined with equable conditions of temperature. It remains for further investigation to precise more definitely the force of each; and also to determine how it is that under such conditions the microbe migrates to the meninges.

It would be interesting to know if the data collected from other laboratories bear out this discovery for the Weymouth cases.

Age of the Patient in relation to Incidence of Cerebrospinal Fever.

Of 29 cases (civil and military) occurring in this area (see Appendix I), regarding whom accurate information as to their ages are available:—

4	per cent	occurred	in	persons	from	5	to 10	years of age.
7	,,	,,	,,	,,		10	to 15	,, ,,
17	,,	,,	,,	,,		15	to 20	,, ,,
38	,,	,,	,,	,,		20	to 25	,, ,,
7	,,	,,	,,	,,		25	to 30	,, ,,
10	,,	,,	,,	,,		30	to 35	,, ,,
7	,,	,,	,,	,,		35	to 40	,, ,,
2	,,	,,	,,	,,		40	to 45	,, ,,
5	,,	,,	,,	,,		45	to 50	,, ,,
3	,,	,,	,,	,,		above 50		,, ,,

On plotting the percentage of cases as ordinates, and the corresponding age-periods as abscissæ, these numbers give the graphical representation of fig. 2.

Fig. 2 shows that, for the epidemic of 1915, so far as the Dorset area is concerned, the most susceptible apparent age is between 20 and 25. To get the most susceptible real age the number of cases in each age-period should be referred to the total number of

persons of that age living in the area at the time. It has not been possible for me to determine the most susceptible real age, owing to lack of the necessary statistics.

Fig. 2.

II.—Contacts.

Identification of the Meningococcus.

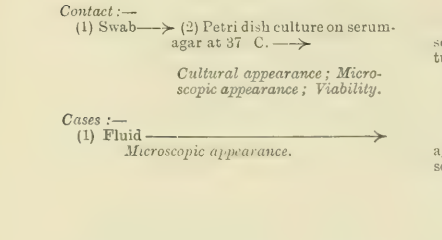
In order to answer the question whether I consider the present methods of identifying the meningococcus satisfactory, it will be necessary to consider each of these, a little in detail, from the point of view of the isolation of the microbe from the throats of contacts, and from the cerebrospinal fluid of actual cases of the disease.

To identify the microbe in the case of a "contact" requires three operations, involving the application of, at least, four, sometimes five, tests. These are :—

(1) Cultural appearance.
(2) Microscopic appearance.
(3) Failure to grow at 23° C.
(4) Viability.
(5) Fermentation reactions.

The suspected "case," on the other hand, I have usually diagnosed in one operation by the application of one test (microscopic appearance) to the cerebrospinal fluid; but to confirm the diagnosis, a second operation, involving the application of three, often four, additional tests, was invariably performed. The operations and the tests associated with each stage when searching for the

meningococcus in "contact" and "case" studies, may be summarized diagrammatically as follows :—


Contact :—
(1) Swab
(2) Petri dish culture on serum-agar at 37 C.
Cultural appearance ; Microscopic appearance ; Viability.
(3) Subculture on a tube of serum-agar at 37° C., and on a tube of serum-agar at 23° C.
Failure to grow at 23° C. ; Cultural appearance ; Viability; Fermentation tests.
Cases :—
(1) Fluid
Microscopic appearance.
(2) Culture on a tube of serum-agar at 37° C., and on a tube of serum-agar at 23° C.
Cultural appearance ; Microscopic appearance ; Failure to grow at 23° C. ; Fermentation test ; Viability.

The general plan of work being set forth, I wish now to consider each of these five tests, somewhat in detail, in order to state what confidence can, in my experience, be placed in them individually and collectively.

Cultural Appearance.—This is usually characteristic : the microbe, from the cerebrospinal fluid of a case, when grown at 37° C. on serum agar, grows in flat, translucent colonies, which become more opaque in the centre as the colonies grow older. In applying cultural appearance, as a method, during the second operation (Petri dish stage) in contact studies, I have frequently mistaken for the meningococcus another microbe, a Gram-negative bacillus, which *grows on serum agar* in translucent colonies very much resembling the meningococcus. So far, then, as a test, cultural appearance does not carry one very far. But not only does this test break down in failing to distinguish the meningococcus from other microbes, it breaks down for the meningococcus itself. I have at present two strains alive: "M." and "G." (see Appendix I), now in the thirteenth and sixteenth generations respectively, which, when first isolated, grew in characteristic translucent colonies, and now grow in small, discrete, opaque colonies, having passed through an intermediate period of growth during several generations in luxuriant, whitish, opaque, heaped-up colonies. And yet, microscopically, these two strains have not changed in morphology; which shows that a stray infection is not responsible for the cultural variation. The factors concerned are unknown; prolonged growth on artificial medium (serum agar) may be incriminated, but I think the most likely factor is the composition of the medium, especially its hydrogen ion concentration. This question is being investigated.

Unfortunately I have not had any facility for animal experimentation at Weymouth, and so have not been able to determine if passage through the body of an animal would restore to these two strains their power to grow in translucent colonies.

Microscopic Appearance.—Relying on the microscopic appearance of the microbe as a test does not carry one very far in "contact" studies, since a host of Gram-negative diplococci, which are not generally believed to have anything to do with cerebrospinal meningitis, of which the chief are *catarrhalis*, *flavus* and *siccus*, all growing on serum-agar at 37° C., are met with in the throats of contacts and normal individuals.

Still, the application of this test, as a method at the second stage of the examination for contacts, effects a considerable "weeding out" of negative contacts; and one has certainly nothing to gainsay about this weeding out. In fact, the microscopic appearance of the meningococcus is its most constant characteristic. The feature on which most reliance can be placed at this stage is, in my opinion, the more or less homogeneous arrangement of the diplococci seen in the microscopic field. Many diplococci, which in the ordinary way one selects from the Petri dish and stains, can therefore be rejected at this stage, as probably not being meningococci, if this characteristic arrangement of the diplococci is not met with on microscopical examination.

Failure of the Meningococcus to grow at 23° C.—This test was mostly relied upon at the third or final stage of the operations carried out to ascertain whether a given "contact" was a "carrier" or not.

As a weeding-out process, the test is most efficient; but the question arises whether it is not too drastic. When first isolated from the cerebrospinal fluid by cultivation on serum agar at 37° C., the meningococcus on being transplanted fails to grow at 23° C., whilst the control grows at 37° C. If this operation is repeated, it will be found that after a number of transplantations at 37° C. the meningococcus is able to grow at 23° C. I have succeeded in doing this with several of my strains: "C.," "G.," "M.," "W.," "H.," all grow to-day at 23° C.

In view of this experimental fact, I am inclined to doubt whether it is wise to reject indiscriminately all Gram-negative diplococci which reach the third stage of the contact examination and are found to grow at 23° C., thereby regarding the contact harbouring them in his nasopharynx as a "non-carrier." This may be stating the matter too strongly, but at any rate *the question arises.*

What, of course, it would be important to determine is whether these strains referred to have lost their virulence in taking on the capacity for growth at 23° C.; also whether on passage through the body of a susceptible animal they would lose their power to grow at 23° C., and regain ability to grow only at 37° C. Unfortunately, as I have already pointed out, animal experimentation has hitherto been out of the question at Weymouth, and I have had to leave the matter there for the present. Of course, if these strains are now avirulent, and were found to remain so after successive passages through animals, that would in itself be interesting.

In the meantime, however, the fact remains: By cultivation on artificial media it is possible to change an originally virulent meningococcus, which did not grow in the first instance at 23° C., into a Gram-negative diplococcus growing at 23° C.; that is, into a microbe which if met with in the throat of a contact, in the ordinary course of an examination for "carriers," would mean that the man from whose throat such a Gram-negative diplococcus came would be labelled as a "non-carrier," and be allowed to mix with healthy individuals. Yet an ancestor of that microbe, only a few generations back, was at work in the central nervous system of an individual stricken with the disease. Who would dare to say that the offspring, in the right environment, should prove to be less virulent than the ancestors?

As a matter of interest the question has arisen in my own experience. A swab from the nasopharynx of the boy F. H. (see Appendix I) was recently sent to the laboratory for examination for the meningococcus, as a preliminary to his being discharged from the Isolation Hospital as cured of the disease. At the second stage of the examination (Petri dish stage: growth, after thirty-six hours at 37° C., from direct inoculation of Petri dish with swab) a Gram-negative diplococcus was met with, which, on transplantation, was found to grow both at 37° C. and 23° C. As I had at this time in the laboratory growing in the eleventh generation the meningococcus originally isolated from his cerebrospinal fluid, I proceeded to compare the two strains (the swab strain growing in the second generation and the C. S. fluid strain in the eleventh generation) by the methods at my disposal.

Table I shows the result:—

TABLE I.

	Cultural appearance	Microscopic appearance	Growth at 23° C.	Viability	Fermentation reactions
H. (cerebro-spinal fluid, 17.5.15)/11	Colonies translucent	Gram-negative diplococcus	Grows at 23° C.	Alive after nineteen days on serum agar at 37° C.	Ferments no sugars or glucosides.
H. (swab, 21.6.16)/2	Colonies translucent, slightly opaque	Gram-negative diplococcus	Grows at 23° C.	Alive after nineteen days on serum agar ? at 37° C.	Ferments no sugars or glucosides.

So that, judged by all the methods at my disposal, the two strains—the one in the eleventh generation and the other in the second generation of culture on artificial media—were identical.

In connexion with this question, whether failure to grow at 23° C. affords a satisfactory method for identifying the meningococcus, the following experiment is instructive. Of seventy-four strains of Gram-negative diplococci, growing at 37° C. but not at 23° C., which were obtained in the ordinary course of events from the throats of contacts who were mostly returned as "carriers" of cerebrospinal fever, it was found on a second transplantation of the growth at 37° C. on two tubes and incubation at 37° C. and 23° C. respectively, that:—

	At 37° C.	At 23° C.
46 gave	+	+
22 ,, ...	+	−
6 ,, ...		−

That is to say, about sixty per cent. of those returned as "carriers" by the first transplantation test would not have been returned "carriers" had they been reported on from the second transplantation. As a matter of fact, what often happened in my early days at Weymouth was, that whenever I obtained, as it seemed to me, too high a percentage of "carriers" amongst any group of men, I frequently transplanted the cultures a second time, with the result that many which were + − gave + + at the second subtransplantation and incubation at 37° C. and 23° C. respectively; so that thus they were not returned as "carriers." My reason for this procedure, then, was that at the beginning I was inclined to be over critical of my own technique; I thought that when no growth occurred at 23° C. it might be because all the culture got rubbed off on the first tube inoculated, and the

second tube was sterile on that account, as both tubes were always inoculated with the same loopful of culture. To guard against this, however, both faces of the loop were smeared in the colony to be subtransplanted and the inoculated tubes were taken haphazard, labelled, and placed in the incubators.

Of course, the explanation of the experiment is to-day evident in the light of what I have already stated about the power of the meningococcus to grow at 23° C., being developed by frequent subculturing on artificial media.

Viability.—In view of the fact that the meningococcus is very short lived when first grown on an artificial medium, this observation can be utilized with advantage in some cases as a method for the identification of the meningococcus. For instance, judged by this principle, the six (— —) readings recorded justify the recognition of the microbe concerned as being the meningococcus, and the meningococcus in the stage of viability usually met with when first isolated from the cerebrospinal fluid of actual cases of the disease. However, as a method, little reliance can be placed on "viability"; for slender viability is no more an essential characteristic of the meningococcus than is "cultural appearance," or "failure to grow at 23° C." In fact, after a few generations of culture on serum agar the life of the meningococcus becomes greatly prolonged. The strains "C.," "M.," "H.," "G.," which I have at present alive can live at least 11, 17, 19 and 22 days respectively between the transplantations.

Fermentation Reactions.—Of the strains now remaining alive in the laboratory only one, the "Ck." strain, shows the fermentation reactions described in the text-books as characteristic of the meningococcus. This strain ferments glucose, also maltose transitorily; but none of the other sugars or glucosides which I have experimented with were fermented by it. The way it ferments maltose is curious: when the culture is examined at the end of twenty-four hours, fermentation is seen to have taken place by the fact that the litmus medium is tinted red, but twenty-four hours later (forty-eight hours in all) the tint is blue, showing that the production of acid has been succeeded by the production of alkali. The fermentation reactions of the different strains "C.," "G.," "M.," "H.," and "Ck.," are being tested from time to time, in view of establishing whether any modification occurs in this direction, analogous to the changes which occur in "cultural appearance," "failure to grow at 23° C.," and "viability." At present the fermentation reactions of these strains are as set out in Table II.

TABLE II.

	Glucose	Maltose	Lactose	Cellose	Saccharose	Glycogen	Salicin
C., /16 ..	+	+	+	0	+	0	0
G., /14 ..	0	0	0	0	0	0	0
M., /12 ..	0	0	0	0	0	0	0
H., /11 ..	0	0	0	0	0	0	0
Ck., /7 ..	+	+	0	missing	0	0	0
Col., /6 ..	0	0	0	0	0	missing	missing

Summary.—In view then of the fact that the meningococcus is far from constant in regard to its "cultural appearance," its "failure to grow at 23° C.," its "viability" and its "fermentation reactions," the conclusion is forced upon me, that the methods at present employed for its identification, in the nasopharynx of contacts, are far from sufficient. But, if that is the conclusion to which the facts—some of them new, and so far as I am aware, stated for the first time—revealed in the foregoing paragraphs lead, their consideration from the point of view of the spread of the disease is even more interesting. In them will be found I think a logical explanation of what has hitherto been a difficult thing to explain: how it is that a microbe so fragile towards antiseptics and short lived as the meningococcus—usually met with in the laboratory, fresh from the cerebrospinal fluid—can be the causative agent of an air-borne disease.

In its power to vary, on prolonged artificial culture, in what have hitherto been considered its more essential characteristics, tending to become more resistant, may lie the explanation of the survival of the microbe in the air, which forms the connecting link between the "carrier" and the susceptible individual. It is highly probable that in the air the meningococcus exists in a more resistant form than that in which it is found in the nasopharynx, or the cerebrospinal fluid, of the "case." Thus, that the "microbe is about" essential to the cosmic hypothesis put forward earlier in this Report may find itself accounted for; indeed, these findings furnish some indirect experimental support to that hypothesis.

III.—Carriers.

Percentage of Carriers in Relation to Overcrowding.

Of the cases of cerebrospinal fever which have come under my observation, 3 occurred in tents, 7 in hospital, 18 in huts, and 7 in houses. On examination of the contacts from these cases, the percentage of "carriers" found was as set forth in Table III.

TABLE III.

Nature of lodgment	Contacts	Positive contacts found	"Carriers." Per cent
Tents	15 ..	0 ..	0
Hospital	210 ..	18 ..	8·6
Huts	500 ..	52 ..	10·4
Houses	52 ..	6 ..	11·5

This table might be taken as indicating that healthy individuals, living in a house, where a case of cerebrospinal meningitis occurs, stands a greater risk of becoming carriers than if the case occurs in a hut; and still greater than if they were sharing the same ward in a hospital; and that the least risk of all would appear to be incurred when the case occurs in a tent.

The Weather in relation to "Carriers."

As weather observations (fig. 1) have been made only for Weymouth, it will be necessary for the present study to separate the Weymouth contacts from those belonging to other portions of my area. Table IV gives the number of "carriers" found in Weymouth for the months in question:—

TABLE IV.

Month	Number of contacts examined	Number of "carriers" found	"Carriers." Per cent
March	239 ..	22 ..	9·1
April	51 ..	8 ..	15·1
May	7 ..	1 ..	14·7
June	91 ..	7 ..	7·7
July	0 ..	0 ..	0

It will be seen, then, that relatively to contacts most "carriers" were found in April and May. The reason for no "carriers" in July is obvious; there was no case, and so there were no contacts to examine. Little importance, however, can be attached to the findings of this table, as the numbers are too small; consequently, it would be unwise to lay much stress on their interpretation in terms of cosmic phenomena.

And yet, the small number of "carriers" in June, shown by Table IV—and confirmed by Table V, for the whole area—is, I think, worthy of notice; for it may possibly be accounted for by the comparatively long period, towards the end of May and the beginning of June, when the air was relatively dry. Moreover the sunshine record for Weymouth in June is fairly satisfactory.

It will be noticed, in passing, that most cases of the disease in Weymouth (fig. 1) occurred in the months of March and June:

a fact in singular contrast with the small percentage of "carriers" for these months.

The Number of "Carriers" in relation to the Stage of the Outbreak.

The number of "carriers" in relation to the season is set out in Table V, which summarizes the results of the examinations carried out in the laboratory since its inauguration in March :—

TABLE V.

Month	Number of contacts examined	Number of "carriers" found	"Carriers." Per cent
March ..	363 ..	40 ..	11·0
April ..	352[1] ..	20 ..	5·7 (or 13·0)
May ..	38 ..	5 ..	13·1
June ..	281 ..	17 ..	6·5
July ..	21 ..	7 ..	33·3

A noteworthy feature of the above table is the small percentage of "carriers" for June. I do not know if this corresponds with the findings for other parts of the country, but, as already pointed out for the Weymouth figures, I cannot help thinking that the period of dry weather which ushered in the month is in some way or other to be held responsible for the result. The finding for July is of no importance ; the abnormally large percentage of "carriers" found is to be explained by the fact that only one case occurred in the month, and the numbers appertain to the contacts of that one case.

"Ro.," and "Ri.," two of the cases occurring in June, are of interest from the point of view of the proportion of "carriers" to contacts in relation to the stage of the outbreak. These two cases occurred in the same hut at Bincombe Camp, Weymouth, within a few days of each other, and the contacts were the same for each. The contacts (twenty-nine in number) were swabbed twice, but no "carriers" were found among them. As a matter of fact, however, finding no "carriers" amongst the men of the hut led me to swab the canteen staffs (eight in number), with the result that two "carriers" were found ; one in the *dry* and one in the *wet* canteen. These carriers may, of course, belong to any month.

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[1] In this number is included 206 prisoners of war, *ex* s.s. "Ascania," examined at the request of the Army Council, regarding whom there is some doubt if they ever were contacts. If this number is deducted from the total number of contacts examined in April, also that of one "carrier," which is all that was found for these 206 men, we get 146 contacts and 19 "carriers." This works out to 13 per cent "carriers" for April.

Age in relation to "Carriers."

Of seven hundred and fifty contacts examined, ranging in age from 16 to 50, Table VI, contains a summary of the proportion of "carriers" to "contacts" found in different age-periods of five years.

TABLE VI.

Age period	Number of contacts examined	Number found positive	Carriers. Per cent
15—20	128 ..	13 ..	10·2
20—25	203 ..	22 ..	10·8
25—30	141 ..	14 ..	9·9
30—35	113 ..	17 ..	15·0
35—40	71 ..	9 ..	12·7
40—45	37 ..	3 ..	8·1
45—50	12 ..	1 ..	8·3

On plotting the percentage of carriers against the corresponding age-periods fig. 3 is obtained.

FIG. 3.

This figure indicates that, other things being equal, the liability to become a "carrier" is greatest between the ages of 30 and 35, or even 40. This finding, taken in conjunction with that of fig. 2, which shows that the apparent most susceptible age for developing the disease is between the ages of 20 and 25, points to an interesting inference; since most "carriers" apparently occur at an age so different from that in which most "cases" occur, the "carrier" must be more or less immune. And this is borne out by actual

experience; few observers have found that "carriers" themselves develop the disease. I have not observed any such cases myself. As a matter of interest, I may mention in this connexion that at various times during my stay at Weymouth I have tried by agglutination studies to get some evidence in support of this hypothesis, which, if true, would lead one to expect to find specific antibodies in the serum of "carriers." I have hitherto been unable to detect by the agglutination method any difference between the serum of "carriers" and that of normal individuals. The explanation of this may be that the strain of meningococcus used for the test was not a suitable one. This investigation, however, I propose to take up again at some other time, perhaps under more favourable conditions. It would be interesting to apply the deviation of complement reaction to the solution of the problem.

Is Nasopharyngeal Catarrh common in Carriers?

Of five hundred and eighty contacts, whose throats were carefully examined at the time of swabbing, a more or less unhealthy condition was noted in regard to 106 of them, while the remainder were healthy. The result of the bacteriological examination was as follows:—

	Carriers found	Carriers
106 unhealthy throats	19 ..	17·9.
474 healthy throats	54 ..	11·4.

These figures are consistent with the view that catarrh or other inflammatory condition of the nasopharynx tends to increase the liability of a contact becoming a "carrier" in the proportion of 17·9/11·4=18/12 approx.=3/2; i.e., one and a half times as great.

How long Carriers continue to harbour the Meningococcus in their Nasopharynx.

The number of days which seventy-two individuals, dealt with by me, were found to harbour the meningococcus in their nasopharynx is shown on the next page.

This works out that seventy-two "carriers" retain the microbe conjointly one thousand and ninety-one days, and this notwithstanding treatment. When expressed as an average this gives, per person, about fifteen days.

		Days
1	was found to harbour the meningococcus	4
2	were ,, ,, ,,	5
3	,, ,, ,, ,,	6
10	,, ,, ,, ,,	7
3	,, ,, ,,	8
2	,, ,, ,, ,,	9
1	was ,, ,, ,,	10
5	were ,, ,, ,,	11
1	was ,, ,, ,,	12
1	,, ,, ,, ,,	13
7	were ,, ,,	14
8	,, ,, ,, ,,	15
3	,, ,, ,,	16
1	was ,, ,, ,,	17
4	were ,, ,, ,,	18
1	was ,, ,, ,,	19
5	were ,, ,, ,,	20
2	,, ,, ,, ,,	21
3	,, ,, ,, ,,	22
1	was ,, ,, ,,	25
3	were ,, ,,	26
1	was ,, ,, ,,	31
1	,, ,, ,,	32
1	,, ,, ,, ,,	34
1	,, ,, ,, ,,	37
1	,, ,, ,, ,,	38
72		

Treatment of "Carriers."

The treatment recommended in all cases has been the nasal spray and gargle indicated by the War Office (Memo. on Cerebro-spinal Fever, February 25, 1915).

IV.—Cases of Cerebrospinal Fever.

Incubation Period.

The only observation at all instructive in this sense, coming under my observation, was that of the two men "Ro." and "Ri" (see Appendix II) living in the same hut at Bincombe Camp. The interval between the sickening of the first and the second case was three days.

Diagnosis.—The diagnosis by bacteriological examination of the cerebrospinal fluid has in the majority of cases been quite trustworthy. In only two cases out of seventeen (twelve per cent approximately) was the diagnosis at first doubtful; and the second lumbar puncture of the two cases in question cleared up the diagnosis.

Specific Treatment.—My opinion in regard to this, based on observation of the patients treated by Captain Barclay, R.A.M.C.(T.) at the Isolation Hospital, Weymouth, is that few cases of cerebro-spinal fever need be lost, provided good doses of an efficient anti-serum are injected daily in the initial stages of the disease.

Appendix.

I.—*List of all Cases of Cerebrospinal Fever dealt with by the Laboratory.*

For convenience the cases are grouped under two headings :—

(1) Cases for which I have personally been responsible for the bacteriological diagnosis (cases occurring in Weymouth, Portland, and Dorchester).

(2) Cases whose cerebrospinal fluids were not sent to this laboratory for examination, the diagnosis being made locally. Only the contacts of these cases were dealt with by me (cases occurring at Bournemouth, Christchurch, Bovington, and Wareham).

Ia.—Military Cases within Boundary of Portland Defences.

Date of lumbar puncture and diagnosis	Rank and Name	Regiment	Regiment No.	Age	Whether fatal	If so, date of death
17.3.15	Private S. ..	3rd Northants..	17233	47	No	..
24.3.15	Qmr.-Sjt. B.	28th Battalion R.F.A.	21702	33	Yes	1.4.15
24.3.15	Private G. ..	3rd Northants..	10211	19	Yes	30.3.15
28.3.15	,, R. ..	3rd Royal Scots	20448	23	No	..
31.3.15	,, F. ..	,, ,,	20276	29	Yes	7.4.15
31.3.15	,, W. ..	14th ,,	20731	29	Yes	31.3.15
9.4.15	,, T. ..	3rd K.O.S.B. ..	18123	23	No	..
13.4.15	,, M. ..	3rd Wilts ..	9814	22	No	..
13.6.15	,, Ro...	,, ..	19285	21	No	..
15.6.15	,, Ri. ..	,, ..	19274	21	Yes	16.6.15
30.6.15	,, Ck. ..	,, ..	20103	19	No	..
4.7.15	,, Hs. ..	,, ..	19144	36	Yes	12.7.15

Ib.—Civil Cases dealt with within Boundary of Portland Defences.

Date of lumbar puncture and diagnosis	Name	Sex	Age	Whether fatal	If so, date of death
30.4.15	F. H. ..	Male	8	No	..
1.5.15	N.	Female	15	Yes	1.5.15 (diagnosed after death)
7.5.15	R.	,,	34	Yes	9.5.15
7.5.15	C.	,,	13	No	..
17.6.15	D.	Male	45	Yes	16.7.15

Ic.—Dorchester.

Date of lumbar puncture and diagnosis	Rank and Name	Regiment	Regiment No.	Age	Whether fatal	If so, date of death
25.4.15	V.	Prisoner of War	4056	23	No	..
1.6.15	Pte. J. Col. ..	D.C.L.I. ..	19502	21	Yes	2.6.15

IIa.—Wareham.

Date the case occurred as notified to the laboratory	Rank and Name	Regiment	Regiment No.	Age	Whether fatal	If so, date of death
12.3.15	Private P. ..	10th Co. 7 Yorks	13011	20	Yes	1.5.15
11.4.15	Driver Be. ..	93rd R.E. ..	61432	19	No	
2.7.15	Private Mo...	13th Worc. ..	20441	21	Yes	9.7.15

IIb.—Bovington.

Onset.						
16.2.15	Pte. G. A. B.	7th Lincs. ..	11245	19	..	..
19.3.15	,, A. Pe...	7th Bords. ..	16113	20	Yes	25.3.15
7.4.15	Driver E. ..	147th Co. A.S.C.	..	..	..	..
17.4.15	Captain W...	9th D. of Well.	..	21	Yes	8.5.15

IIc.—Swanage.

14.3.15	Gunner Dy...	R.F.A. ..	72165	20	No	..

IId.—Bournemouth District.

15.3.15	H. R. N. ..	Civilian ..	..	33	Yes	17.3.15
20.3.15	Mrs. Ws. ..	,, ..	..	51	,,	13.4.15
28.4.15	Gunner Rb...	43rd Batt. 3c Res. Brig.	65633	19	No	..
1.6.15	Gunner Gw...	R.F.A. ..	71542	37	,,	..
13.6.15	Private Ts. ..	S. Lancs. ..	1457	21	,,	..

II.—*Date of Onset of the Disease for the Weymouth Cases.*

In order to fix as accurately as possible the date of onset of the disease in view of fig. 1 (p. 547), a circular letter was drawn up and sent out to the various patients who had recovered from the disease, or to the relatives, requesting definite information in regard to the following five points :—

(1) What day did the patient first feel ill?
(2) What did he complain of when he took ill?
(3) What was he doing the day before he took ill?
(4) Did he have any sore throat before he took ill?
(5) What day did he first report sick to his Medical Officer?

Answers to the essential questions have been taken more or less *verbatim* from the original letters which are in my possession, and the following table contains a brief *résumé* of the same. Where written statements could not be obtained, as in the case of some of the men who died, the isolation hospital records have been consulted.

TABLE.

Name of patient	Questions asked to fix the date of Onset, with Replies. Authority for the same			
	(1) What day did patient first feel ill?	(2) What did patient complain of when he took ill?	(3) Had patient any sore throat before taking ill?	Authority
Private S.	March 6 to 7 ..	Giddiness, headache, and stiffness of neck	No record	Isolation Hospital Records.
,, G.	,, 22 to 23 ..	Sore throat on March 22; not seen again by medical officer till March 24, when characteristic symptoms of cerebrospinal fever were present; was delirious, and suffered from retention of urine	Yes, see (2)	,,
Qmr.-Sjt. B.	It is not possible to fix the date of onset in this case; history of a very long-standing illness	..	..	,,
Private F.	March 26 ..	Severe rigors on March 26 and 27. Frontal headache on March 28	No record	,,
,, W.	Admitted to hospital on March 27 for influenza	Frontal headache. A petechial rash resembling insect bites was noticed and patient was delirious at night. There was no rigidity	,,	,,
,, R.	March 27 ..	"Headache"	No	Patient's written statement.
,, T.	April 3 ..	Frontal headache and stiffness of neck	No record	Isolation Hospital Records.

TABLE—*continued.*

Name of patient	Questions asked to fix the date of Onset, with Replies. Authority for the same. (1) What day did patient first feel ill?	(2) What did patient complain of when he took ill?	(3) Had patient any sore throat before taking ill?	Authority
Private M.	April 11 ..	Headache, sore throat, stiffness of neck, and "all of a shiver"	Yes, for a week previously	Patient's verbal statement.
,, Ro.	June 11 ..	Felt stiff on the afternoon of June 11. Woke up with headache and sore throat on June 12; also felt giddy	Yes, see (2)	,,
.. Ri.	,, 14 to 15 ..	Came off parade on June 14, not feeling well and complaining of pain in the left testicle. Next morning, he was sick with vomiting, and in a comatose condition	No	Father's verbal statement.
,, Ck.	.. 28 ..	Came off parade on afternoon of June 28. Woke up on the morning of the 29th with a stiff neck, giddiness and sweating	,,	Patient's verbal statement.
, Hs.	,, 25 to 26 ..	Came off parade on June 25 not feeling well, next morning and subsequent two days he complained of stiffness in back of neck, dizziness, and headache.	..	Verbal statement of Private W. Franklin.
Mary C...	April 12 ..	Headache, which became so severe as to force her to "take to bed on April 17. After this date nourishment and medicine could not be retained"	"None whatever"	Mother's written statement.
F. H. ..	,, 23 ..	"Sickness, with severe headache and stiffness of the side of the neck"	No	Father's written statement.
F. N. ..	,, 26 ..	"Headache, and on the 27th sickness"	,,	Mother's verbal statement.
E. Rs. ..	May 4th ..	"Very cold, and great pain in her head"	,,	Husband's written statement.
J. D. ..	June 11 ..	"Pains in his back, the back of his neck, and in head"	,,	Wife's written statement.

III.—*Meteorological Data.*

The meteorological readings which follow are from the records kept by J. H. Bolam, Esq., M.Sc., Weymouth, who kindly placed them at my disposal. For the calculation of the relative humidity use has been made of the table given by Marriott ("Hints to Meteorological Observers," London, 1911, pp. 58-60).

MARCH.

Date	Sunshine	Relative Humidity			Temperature		
	In hours	Dry bulb readings in degrees Fahrenheit	Wet bulb readings in degrees Fahrenheit	Relative humidity	Maximum temperature in degrees Fahrenheit	Minimum temperature in degrees Fahrenheit	Range. Maximum temperature
1	9·2	41·9	36·5	62	46·8	37·5	0·199
2	4·5	40·6	37·7	78	48·3	34·0	0·296
3	0·0	48·4	47·8	95	48·9	39·1	0·200
4	3·2	48·9	47·6	90	53·7	44·3	0·175
5	0·2	48·9	47·7	91	51·1	46·1	0·098
6	3·0	47·8	45·6	84	54·8	44·9	0·181
7	0·5	46·9	43·5	76	49·0	45·2	0·078
8	6·0	38·9	35·2	71	43·5	34·5	0·207
9	3·7	34·5	32·6	81	44·4	30·4	0·315
10	2·8	41·0	38·2	78	48·8	34·0	0·303
11	2·5	47·5	46·5	92	56·1	40·0	0·287
12	2·3	44·0	42·9	91	53·4	41·3	0·227
13	9·0	44·0	41·8	83	55·4	39·0	0·296
14	1·8	49·2	47·1	86	54·1	41·1	0·240
15	0·0	47·9	46·3	88	51·5	44·0	0·146
16	0·2	43·0	41·2	86	49·2	38·0	0·228
17	0·0	45·1	40·5	68	48·3	41·8	0·135
18	4·0	45·0	40·5	69	45·2	41·1	0·091
19	9·4	37·4	32·9	65	43·8	32·9	0·285
20	11·0	42·3	38 0	69	52·7	26·2	0·503
21	10·7	46·3	41·8	69	50·8	28·8	0.433
22	0·0	44·8	40·7	72	49·7	41·2	0·171
23	2·9	50·1	49·6	97	55·1	42·1	0·236
24	0·7	49·1	48·5	96	55·1	46·5	0·156
25	0·0	48·6	47·2	89	48·3	43·0	0·110
26	7·2	40·0	36·3	72	45·0	32·0	0·290
27	5·5	37·5	33·1	66	42·8	30·5	0·287
28	6·4	38·4	33·4	62	43·4	30·0	0·309
29	5·2	38·6	33·4	61	42·2	27·1	0·358
30	8·2	36·9	32·2	61	43·4	27·2	0·373
31	10·7	43·8	38·5	63	49·1	31·0	0·369

April.

Date	Sunshine	Relative Humidity			Temperature		
	In hours	Dry bulb readings in degrees Fahrenheit	Wet bulb readings in degrees Fahrenheit	Relative humidity	Maximum temperature in degrees Fahrenheit	Minimum temperature in degrees Fahrenheit	Range. Maximum temperature
1	3·3	45·7	42·6	78	55·2	29·2	0·472
2	3·8	49·8	44·8	68	51·2	32·8	0·359
3	0·0	46·5	45·3	91	50·4	39·2	0·222
4	3·4	50·1	48·5	89	53·8	45·6	0·152
5	0·0	47·2	45·3	86	50·8	43·0	0·154
6	0·3	47·5	45·4	85	50·0	40·1	0·198
7	7·0	50·0	46·9	79	53·4	44·2	0·172
8	10·0	49·8	44·7	67	53·0	41·1	0·225
9	7·8	48·4	43·1	66	53·1	42·0	0·209
10	0·8	50·0	46·2	74	54·5	44·0	0·193
11	0·0	50·0	47·8	85	52·4	45·0	0·141
12	0·0	51·2	49·8	90	54·4	47·1	0·134
13	9·0	47·0	42·2	67	53·4	38·1	0·287
14	8·5	47·3	42·1	66	56·2	38·0	0·324
15	0·9	50·1	45·8	72	56·9	42·1	0·260
16	6.3	54·5	50·3	73	60·6	42·0	0·308
17	5·2	48·0	42·4	64	54·8	39·0	0·288
18	11·5	51·9	46·4	66	55·1	40·1	0·272
19	8·2	51·9	47·5	72	57·1	37·0	0·352
20	0·1	50·4	48·0	83	52·8	47·2	0·106
21	10·2	47·8	46·8	92	53·8	34·1	0·368
22	1·1	49·9	44·2	64	54·2	37·2	0·314
23	2·0	43·8	41·0	79	51·4	41·6	0·191
24	4·0	51·7	45·3	61	55·2	35·0	0·366
25	2·6	49·6	43·0	59	51·2	35·1	0·314
26	11·0	50·5	46·5	73	60·2	42·8	0·289
27	11·7	49·5	45·3	72	60·2	44·0	0·269
28	10·2	58·3	52·4	67	68·7	44·6	0·351
29	10·1	58·2	49·8	55	64·4	45·1	0·300
30	9·4	59·8	52·7	62	63·0	42·2	0·330

May.

1	0·0	50·0	48·8	92	53·0	45·1	0·130
2	3·7	53·1	52·0	93	58·0	48·0	0·172
3	6·3	51·4	46·1	67	55·0	42·9	0·220
4	0·0	48·2	47·4	94	50·9	44·0	0·136
5	3·7	51·1	50·1	93	61·2	47·2	0·229
6	8·5	60·8	56·0	72	70·2	49·0	0·302
7	12·1	67·4	59·1	59	63·8	55·0	0·138
8	8·0	63·6	57·4	67	72·0	54·4	0·244
9	10·5	59·7	51·1	55	65·8	45·7	0·154
10	13·1	52·5	46·1	61	67·1	38·2	0·431
11	12·6	63·4	51·8	46	67·1	44·0	0·344
12	1·3	57·2	52·6	73	62·2	48.0	0·228
13	0·0	53·2	52·7	96	54·1	48·6	0·101
14	3·7	44·2	41·1	78	53·2	37·9	0·288
15	2·0	51·1	47·2	75	55·2	38·5	0·302
16	0·3	52·6	50·9	89	56·3	44·0	0·218
17	0·5	53·6	52·3	91	58·8	49·2	0·163
18	1·5	47·9	46·5	89	58·2	47·0	0·192
19	8·4	55·2	50·1	69	56·4	41·0	0·272
20	3·4	56·8	55·2	89	61·2	50·0	0·188
21	1·5	56·9	55·3	89	66·2	50·2	0·242
22	10·6	66·2	61·3	74	75·8	53·0	0·301
23	13·8	67·0	58·5	58	75·0	55·0	0·267
24	14·5	66·8	56·8	52	74·7	52·0	0·304
25	12·7	65·2	56·8	58	75·2	51·0	0·321
26	11·1	71·0	62·1	58	76·1	57·1	0·247
27	14·3	58·6	49·9	54	66·7	48·2	0·278
28	10·3	55·8	48·5	59	61·1	41·0	0·329
29	12·6	60·9	54·1	62	65·0	43·0	0·339
30	10·9	55·2	47·2	56	59·0	40·1	0·310
31	13·7	58·9	50·3	54	61·8	40·0	0·353

JUNE.

Date	Sunshine	Relative Humidity			Temperature		
	In hours	Dry bulb readings in degrees Fahrenheit	Wet bulb readings in degrees Fahrenheit	Relative humidity	Maximum temperature in degrees Fahrenheit	Minimum temperature in degrees Fahrenheit	Range. Maximum temperature
1	8·0	60·2	52·1	58	68·5	45·0	0·343
2	11·8	66·1	56·5	53	67·1	47·1	0·298
3	0·0	53·0	50·9	86	57·5	49·0	0·148
4	6·3	54·2	52·8	90	61·0	50·9	0·165
5	0·2	57·9	56·1	88	61·1	53·0	0·132
6	3·7	58·2	55·8	85	64·0	54·1	0·155
7	7·4	55·0	53·5	90	71·1	49·0	0·311
8	13·5	68·9	62·6	68	73·1	54·0	0·261
9	1·7	65·0	59·2	68	72·1	52·2	0·276
10	5·3	66·1	60·8	72	72·1	58·1	0·194
11	3·6	61·5	56·2	71	65·0	57·5	0·115
12	9·0	61·9	55·8	67	66·0	52·1	0·211
13	10·3	65·1	55·0	52	74·8	51·9	0·306
14	11·5	56·6	51·2	68	64·0	52·1	0·186
15	11·6	56·5	51·8	72	64·9	47·1	0·274
16	13·5	64·8	56·9	59	71·2	46·9	0·341
17	10·7	70·0	60·1	54	73·8	49·2	0·321
18	12·1	61·0	53·8	61	62·3	52·1	0·163
19	12·4	59·7	52·0	59	65·0	44·0	0·323
20	10·7	60·5	53·6	62	63·9	46·0	0·280
21	0·3	56·8	54·8	87	64·3	52·0	0·191
22	0·4	61·6	54·9	64	66·5	56·5	0·150
23	2·7	59·8	56·3	79	64·2	52·6	0·181
24	3·4	56·6	53·6	79	64·4	52·2	0·189
25	0·2	57·9	55·2	84	64·8	54·0	0·167
26	10·3	57·0	55·3	89	64·5	51.9	0·195
27	1·1	62·1	57·9	76	62·3	54·0	0·133
28	0·6	57·3	56·1	92	60·2	55·0	0·086
29	5·5	58·1	56·9	92	67·7	53·6	0·211
30	3·7	60·0	57·3	84	67·1	55·6	0·171

Clinical and other Notes.

A STRIKING CASE OF ORAL SEPSIS.

By Captain ADOLPHE ABRAHAMS.
Royal Army Medical Corps.

During its career of universal popularity, oral sepsis was credited with the capability of causing every ill from which mankind was prone to suffer, from glands in the neck to appendicitis, from simple dyspepsia to pernicious anæmia, from Ludwig's angina to rheumatoid arthritis; from conditions obviously and directly associated with the mouth to conditions for which pathology supplied no clue whatever.

So excessive were the claims advanced for the malevolence of what has been cynically described as the more septic end of the alimentary canal, that the inevitable reaction has resulted in an undue tendency to discredit its influence, particularly as the co-existence of teeth in an indescribable condition with apparently perfect general health is in certain classes of society the rule rather than the exception.

Occasionally a clear case of indictment occurs to remind one that the subject of oral sepsis is by no means to be disregarded so drastically as the swing of the pendulum has induced one to think. The following notes of such a case appear to me to be striking enough to deserve a full description.

Private T. S., aged 30, was admitted to the Connaught Hospital, Aldershot, on July 11, 1915, stating that he had been ill four days with headache, pain in the back, and slight cough, that he had been taken suddenly ill, although he had not vomited nor shivered, and that he had never suffered from any previous illness. On admission his temperature was 102·2° F., pulse 98, respirations 24. The note describes him as a very dark, spare man who has been abroad, but has never had any tropical disease. "Teeth dreadful." There was no evidence of any thoracic trouble, except slightly harsher breathing at the right apex. Leucocytosis, 19,200. There was a slight cough with clear sputum. He was regarded as probably a case of right apical pneumonia.

The note on July 29th states: Intermittent fever has been present since the above, the temperature has been at its highest (102° F. to 103·5° F.) almost every day at 6 p.m., and the pulse rate has risen synchronously. The leucocyte count has varied, between 20,000 and 24,800, the differential count always showing an increase of polymorphonuclear cells. The blood has been examined twice for organisms and on several occasions for the malaria parasite, always with negative result. Large doses of quinine have been without influence. The urine has been twice examined and is sterile. Slight general bronchitis has been

present; repeated examinations of the sputum for the tubercle bacillus have been made with negative result.

For the first half of August he improved as regards his temperature, but from the 14th onwards intermittent fever recurred, with increased pulse frequency and leucocytosis. He appeared to be losing ground more rapidly, and a note on August 25 states that his weight is now only 9 st. 12 lb. (Weight, August 4, 10 st.).

Since his condition pointed beyond any doubt to some form of persistent sepsis, and since the most exhaustive examinations had failed to elicit the slightest information, it seemed reasonable to incriminate the septic teeth as the only possible source. The patient, who had refused early in his illness to undergo dental treatment or to believe that his teeth, which "had never ached in his life," could be the cause of his trouble, now yielded more easily to fresh pressure, and on August 30 five carious stumps were removed. On this day his temperature was 103° F., pulse 116, weight 9 st. 10¾ lb.

On September 3 three teeth were extracted. The temperature remained intermittently raised as before until September 10, and not a little doubt was cast upon the advantage of his dental experiences. But on that day the temperature fell to 97° F., and for the rest of his stay in hospital (until October 2) it never rose above 98° F., the pulse-rate varying considerably from 44 to 92. On September 20 the last seven offenders were extracted.

More striking than the cessation of fever was the general improvement. As stated above, the weight on August 30 was 9 st. 10¾ lb. On September 16 it was 10 st. 4 lb.; on September 23, 10 st. 8¾ lb.; and on September 30, 11 st. The patient, despite obvious masticatory difficulty, "could not get enough to eat."

A final point of interest was the leucocyte count. On August 22 it was 19,000; polymorpho-nuclears, 81·8 per cent. On September 10 28,200; polymorpho-nuclears, 79 per cent. On September 16, 19,200; polymorpho-nuclears, 71 per cent. (Temperature that day 97·4° F.; pulse 64.) On September 21, 27,200; polymorpho-nuclears, 75·1 per cent. (Temperature that day 97·8° F., pulse 60.) On September 28, 11,800; polymorpho-nuclears, 66 per cent. On October 2, 9,000. In other words, the polymorpho-nuclear leucocytosis persisted with gradual subsidence during the completely apyrexial period of his recovery.

I am greatly indebted to Lieutenant-Colonel W. Turner, Commanding Officer to the Connaught Hospital, for permission to publish these notes, and to Lieutenant Cregan, dental surgeon, and to Lieutenant Francis Jones, R.A.M.C., pathologist to the hospital, for their invaluable assistance and for the continued interest they took in this case.

AN UNUSUAL FORM OF PROJECTILE.

By C. HAMILTON WHITEFORD, M.R.C.S., L.R.C.P.
Specialist in Surgery, the Military Hospital, Devonport.

A BOMB, composed of a tin, size five by three and a half inches, covered with cloth, containing mud, gun cotton, a detonator and a fuse, exploded while in the right hand of a sergeant, who was instructing a group of men. The sergeant's hand was blown off at the wrist, and four of the privates were injured.

One man, who had been standing three yards from the sergeant, was admitted to hospital with six lacerated wounds of the right thigh and leg.

The skiagram showed a piece of metal in one wound, and at the sites of the other wounds were dark blotches attributed to the in-driven mud.

From a small wound on the outer side of the knee there was a free flow of synovial fluid. From another wound on the outer side of the knee-joint were removed portions of mud and small masses of bone, the size of a pea, portions of which were covered with articular cartilage, the nodules of bone being held together by strips of fibrous tissue.

Although the portions of bone did not resemble any part of the knee-joint, it was at first feared that this might have been injured.

Among the muscles in the middle of the thigh were found similar nodules of bone with pieces of trousering, and similar foreign bodies were removed from the upper thigh.

In the two latter situations, it was obviously impossible for nodules of bone capped with cartilage to have been detached from the patient.

Further inspection of the nodules and their connexions of fibrous tissue showed them to be comminuted joints from the sergeant's hand.

NOTES ON A CASE OF TETANUS OF SHORT INCUBATION PERIOD, WITH RECOVERY.

By CAPTAIN R. LESTER SCOTT.
Royal Army Medical Corps.

THE sudden development of tetanic seizures following operative treatment on a wound incurred five days previously is sufficiently rare to warrant publication.

The patient, Lieutenant ——, was wounded on July 23, 1915. He was admitted to a Base Hospital on July 25, suffering from a circular punched-out wound on the anterior aspect of the left thigh, about the middle third, of the size of a 4s. piece. The wound was caused by the accidental discharge of a flare pistol.

Month and date	Temperature	Pulse	Serum therapy	Carbolic acid	Sedatives	Spasms	General condition
Admitted, 25.7.15	101·8°	92	.. .. ..	..	.. ..	.. ..	.. ..
Operation, 26.7.15	100·2	84	.. .. ..	..	.. ..	.. ..	.. ..
Onset, 28.7.15	102·4°	136	Subcutaneous, 1,500 units, 10 a.m. Intrathecal, 4,000 units, 6 p.m. Intravenous, 16,000 units, 10 p.m.	2 c.c. 5 per cent., two-hourly. Subcutaneously	Potassium bromide. 15 gr., and chloral hydrate, 10 gr., two-hourly; morphia, ¼ gr. at night	Fibrillations of affected extensors in the morning every fifteen to twenty seconds. Extended to trismus, rigidity of the neck and violent spasms of affected extensors by evening	Patient unable to flex neck, and only able to open mouth ½ in
29.7.15	101·8°	136	Intravenous, 15,000 units, 10 a.m; 6,000 units at 10 p.m.	Ditto	Potassium bromide and chloral changed to morphia at night	Severe spasms every one to three minutes	Opens mouth about ¼ in. Takes fluid nourishment well under opiates and sedatives.
30.7.15	101·4°	120	Intrathecal, 4,000 units; intravenous, 6,000 units	Ditto	Potassium bromide and chloral every two and a half hours	Spasms not quite so severe	Does not shout out with pain as formerly. Dozes fairly well, but wakes after a specially strong contraction. Is quite rational when awake. Bowels moved after an enema.
31.7.15	99·0°	120	Intramuscular, 4,000 units, 10 a.m. and 6,000 at 10 p.m. Intrathecal, 3,500 units at 10 p.m.	Ditto	.. ..	Risus continuous. Contractures about every five minutes. Severe contractures about every half hour	Macular rash on chest and abdomen. Opens mouth ½ to ¾ in. No carboluria. Feels better.
1.8.15	100·4°	112	Intramuscular, 6,000 units	2 c.c. 5 per cent. four-hourly	Chloral and Potassium bromide three doses during the day. Morphia at night	Less severe and about every half hour	Sleeps well. Bowels opened with an enema.

2.8.15	99·0°	102	Intrathecal, 3,500 units Subcutaneous, 6,000 units	Ditto	..	Slight spasms and pain, controlled by sedatives	Covered with macular eruptions.
4.8.15	99·6	92	Subcutaneous, 5,000 units	Discontinued	No bromides or chloral all day	No spasms or twitchings	Complains of "seeing oojects," probably due to accumulative effect of large doses of potassium bromide and chloral. Moves about in bed without aid.
7.8.15	99·0°	92	Subcutaneous, 3,000 units	..	During the 5th and 6th no bromides or chloral given, $\frac{1}{4}$ gr. morphia at night. During 7th two doses of sedatives given	Muscular contractions very much lessened. They do not wake patient while asleep	Same.
9.8.15	98·4°	96	Subcutaneous, 2,000 units	..	$\frac{1}{4}$ gr. morphia given since 7th	No spasms or twitchings since 7th	Opens mouth better.
12.8.15	98·4°	92	Subcutaneous, 2,500 units	..	Occasionally at night morphia, $\frac{1}{6}$ gr. given to secure sleep	No further twitchings or spasms	Hallucinations stopped.
14.8.15	99·0	100	Subcutaneous, 3,000 units	..	Ditto	Frequent spasmodic contractions in left extensors, throwing momentarily rest of body into same condition	Has complained of pain in the wound. Recurrence of spasms, but not nearly so severe. Slight diarrhœa.
15.8.15	98·2°	92	Subcutaneous, 3,500 units, 10 p.m.	..	Very occasionally 6 gr. morphia given	Several sharp spasmodic seizures, occasionally calling out with pain	Wound looking healthy. Very little discharge. Opens mouth wider. Takes fluid nourishment well. Diarrhœa stopped.
17.8.15	98·8°	88	.. .. ..	..	None	Severe contractures ceased. Only a few twitchings in wounded leg	Had a very good day. Sleeps well.
20.8.15	97·8°	96	Subcutaneous, 1,500 units	..	None	No twitchings	Beginning to take solid food. Much better. Sleeps well at night.
Discharged 3.9.15	..	..	.. .. ..	..	.. ..	No spasms since August 15, 1915	Can walk without aid. Risus disappeared. Wound nearly healed. Opens mouth to nearly full extent. Can take solid food.

The temperature on admission was 101·6° F. The wound was foul, discharging pus, and on pressure much gas was liberated. There was tenseness to the extent of two to three inches around the wound. The skin here had a brownish appearance.

Operation August 26, 2 p.m. The wound was enlarged and five pieces of revolver fuse were extracted. Necrotic tissues were cut away as far as possible.

August 28, 9 a.m. The patient complained of pain in the wound and "jerkings" in the affected limb. On examination there were only fibrillations to be seen in the exposed muscles at the site of the wound. These fibrillary contractions took place about every thirty seconds. There were no other symptoms to be noted. Temperature was then 99° F., pulse 114. There was no reliable evidence that a prophylactic dose of anti-tetanus serum had been administered, so one thousand five hundred units were at once given subcutaneously into the abdomen.

By 6 p.m., when patient was again seen, definite symptoms of tetanus had supervened. Clonic spasms took place every few seconds in the affected limb, throwing the rest of the body into rigid contraction. There was slight opisthotonos and the muscles at the back of the neck were stiff. Trismus was marked. Patient shouted with pain at every seizure, and with difficulty his mouth could be opened half an inch.

It is thus evident that the initial symptoms commenced about thirty hours after the operation and five days after the patient was wounded.

The accompanying table shows the effect and the result of pushing the serum treatment. The temperature and the pulse-rate recorded are the highest during a period of twenty-four hours. The total amount of serum administered was 102,000 units. The intravenous and intrathecal administrations of the serum were given under chloroform anæsthesia.

It seems more than probable that the operation laid bare fresh tissues, and there resulted rapid absorption of toxins which had been already elaborated in the necrotic area.

During the whole course of the disease there was no carboluria, albuminuria, or necrosis of tissues. There was no paresis or paralysis of the cranial or any other nerves. The wound on discharge of the patient was practically healed, and he was so far convalescent that he was able to walk.

The interesting features of the case briefly summarized are as follows:—

(1) The incubation period was short.

(2) There is no doubt that the operative interference some days after wound infection had a definite effect on both onset and severity of the attack.

(3) There is equally no doubt that the attack was a severe one, characterized by clonic and tonic seizures associated with great pain.

(4) The essence of the treatment consisted in the adoption of immediate, persistent, and almost extravagant serum therapy.

(5) The result of the treatment was an uncomplicated recovery, with entire absence of secondary lesions.

TRANSMISSION OF MALARIA IN NORTHERN FRANCE.

By Captain J. H. DIBLE.
Royal Army Medical Corps.

The presence of malaria-infected persons in the area occupied by British troops in Northern France raises the question of the likelihood of transmission of the disease to uninfected subjects living in the same districts. The cases quoted below show that such transmission can and does occur.

Both of these cases were sent from the Front to a base hospital. In neither case had a diagnosis of malaria been arrived at when they were admitted here.

Case 1.—Private O., Black Watch, was taken ill whilst in the trenches with his battalion about a fortnight prior to his admission. He complained of pains in the head, general malaise, and attacks of shivering; also of pain in the left side over the splenic area. The symptoms first commenced at about mid-day, and recurred daily, starting with chilliness and shivering, which was later followed by sweating and amelioration of his condition. He was admitted to this hospital as a case of indeterminate pyrexia; an accompanying temperature chart showed periods of pyrexia occurring at about 2 to 3 p.m. daily; on three occasions rigors had been noted. He complained of pain over the splenic region, but the organ was not palpable. The history was thus that of a typical quotidian fever.

On the day of admission (August 26) he had a rigor at noon, and at 2 p.m. his temperature stood at 104·6° F. Blood-films taken at this time showed the presence of numerous malarial parasites, mostly moderately grown plasmodial forms, with scattered particles of hæmozoin pigment, though less mature and young ring forms were also seen. The appearances of the parasite identified it as that of tertian fever. The condition entirely subsided under the administration of quinine.

Prior to the War this patient had never been out of Scotland. He was a pottery worker by trade, and had spent most of his life in the vicinity of Paisley. He came to France on May 10, 1915, and landed at Boulogne, from whence he was moved to the Armentières-Bailleul district, and thence after a short time to Lillers, and on to ———, where he remained until the occurrence of his present illness. When not in the trenches he was billeted in various farms; both in billets and in the trenches he suffered a good deal from mosquito bites.

Case 2.—Gunner G., Royal Garrison Artillery, admitted to base

hospital, August 24, 1915. He had been taken ill at the village of ———, near Lestrem. The illness began in the evening, and was of sudden onset with pains in the head and legs, malaise, and shivering, which were, after a time, succeeded by fever and sweating with relief to his symptoms. The following day the attack recurred, and he "reported sick." He was laid up in his bivouac for three days, and finally evacuated as a case of influenza. In hospital he was found to have a marked intermittent fever, the periods of pyrexia recurring every second day, and the temperature reaching on an average 105° to 106° F. The spleen was not palpable. Blood-films, taken during the cold stage of one of the attacks, were found to contain numerous malarial parasites. These, at this time, were chiefly the fully grown and early sporulating forms; in addition typical sporulating forms were seen. The appearances of the parasite and the number of merozoites to which it gave rise enabled it to be identified as that of tertian fever, the *Plasmodium vivax*.

This man, also, had never been out of England prior to joining the Expeditionary Force. He had served four years in the Army and had never seen foreign service. Before enlisting he had been a labourer. He came to France on August 17, 1914, landing at Rouen and subsequently being at Mons and through the retreat. After the battle of the Marne he was in the Ypres district from October to April, when he was moved to the vicinity of Lestrem, where he has been quartered ever since. During the summer he has bivouacked under a temporary tarpaulin shelter in the orchard of a farmhouse; this bivouac was within fifty yards of a canalized river and in a low-lying field surrounded by stagnant dykes, such as are a prominent feature of this part of French Flanders, He was much bitten by mosquitoes.

The significance of these two cases lies in the fact that the possibility of their being recrudescences of an old-standing infection does not occur, so that, in both cases, the infection has taken place in French Flanders, where, so far as I am aware, there is no endemic malaria.

Both these men, then, have contracted the disease in the region occupied by the British Army, and it is logical to conclude that malaria-infected mosquitoes are now present in this area.

The country in which these cases occurred is eminently suited to the mosquito, being flat and well watered. It is largely intersected with deep dykes which, even in the height of summer, have some feet of stagnant water in them and form an excellent breeding-ground. Moreover, the farms of this region are of a very insanitary description and an abundance of decaying organic material is inevitably to be found in their vicinity. Anyone who has lived in this part of France during the summer months can testify to the abundance of mosquitoes, and these are an especial nuisance to the men who commonly bivouac in small tarpaulin shelters of their own construction. In these low shelters mosquitoes and flies of all kinds are extremely abundant and very troublesome.

The country is, then, infested with mosquitoes. Prior to the War there were presumably no malarious inhabitants in this region, but, with the coming of the British Army a certain number of individuals have been introduced with the parasite in their blood and all the factors for the transmission of the disease are thus present. It is a significant fact that the patient in the second of the above-cited cases had, for the whole of the summer, been living in a part of the country which has long been occupied by a division of the Indian troops and where recrudescent cases of malaria are consequently comparatively common.

The occurrence of cases such as those above quoted raises the larger question of the possibility of the disease remaining endemic, and suggests the necessity for the adoption of strictest anti-mosquito measures.

RECEPTION OF WOUNDED WHEN ON ACTIVE SERVICE.

By Major G. BAILLIE.
Royal Army Medical Corps.

Although it may seem somewhat belated to send notes on the subject of reception of wounded, and as each unit has a method of its own which has been found to work well, my excuse for doing so is because the system which has been adopted at this 22nd General Hospital has now been tried for more than three months, and found to work quite smoothly, and in consequence may prove useful to other general hospitals as yet in formation.

There are some important preliminaries to be noted before coming to the actual reception of the wounded in a general hospital.

This general hospital has its wards divided into three sections, viz.: Section "A" (all medical), consisting of eight wards. Section "B" wards 1, 2, 3, 4, surgical; No. 5, dental; No. 6, eye, ear and throat; Nos. 7, 8, 9, medical. Section "C" (all surgical consisting of eleven wards), No. 11 genito-urinary.

The chart on p. 581 is used for the daily return of vacant beds in wards which the medical officers in charge of the medical and surgical sections render daily to the registrar as the wards which they desire to have utilized in the event of a convoy arriving, and for noting the numbers admitted to each ward when the convoy arrives.

The column for "Vacant Beds" is filled in every morning as soon as the wardmasters hand in their lists of beds available in each ward, and later as soon as a convoy is notified each wardmaster places the kits (according to the numbers of vacant beds in each ward) for the patients in the wards which will be assigned to them. This should be done so that the nursing orderlies will not have to do so when the patients arrive, also it may be noted that two extra orderlies are placed on duty at the bath tent to act as conductors for the patients on returning to their

wards, and so release the nursing orderlies who have brought the patients down to the bath tent.

Then one notice of the wards, which will be utilized in event of the arrival of a convoy, is given to the matron, and one is posted up in the officers' mess, it being understood that wards B 5 and 6 may be utilized at any time. If a convoy does not arrive the list of wards to be used holds good until such a time as one does arrive.

The reception tent is a large store tent pitched near the main roadway, with flooring if possible, or if this is not possible the ground is covered with tarpaulin, half a dozen forms for the walking cases to sit on during such time as the stretcher cases are being attended to; there are two large deal tables placed side by side, one for the registrar, and the steward, who enters the diets considered most suitable for each case, and one for two clerks who write down the patients' particulars. Two trestles are placed in front of the registrar's table, about 3½ ft. high, on which the stretcher-bearers place the stretcher while a ward is being assigned and the clerks enter the ward, number, rank, and name, on the index card. On the registrar's right there is a block of wood about 3 ft. long, 1 in. deep, and 4 in. in width, with a number of 3-in. nails driven through, with points upwards corresponding to the numbers of wards in the surgical section, and on each nail according to the number of beds available in each ward there are corresponding numbers of small pieces of paper with the number of the ward written on; one of these pieces of paper is given to each patient as soon as the ward he should go to has been assigned. These pieces of paper must be renewed daily, either owing to an evacuation of patient or the arrival of wounded. In the column "Patients admitted" a straight line is put down to signify a patient who has been injured or ill otherwise than from gunshot wound; a "cross" for gunshot wound (this enables the number of wounded admitted from a convoy to be easily ascertained and wired to the War Office at once), and a small "S" after each admission which has been a stretcher case; this latter precaution is to avoid sending too many serious cases to any one ward; it is also advisable to send about six cases to one ward and the next six to another ward and so on, and then to return to the first ward used, so as to allow the nursing staff time to attend to the cases. A similar board to the one described for the surgical section is also used for the medical section.

Placed in front of the clerks there is a long narrow box divided into sections corresponding to the numbers of the wards, into which the index cards (as soon as the patient's ward has been entered, and his number, name, and rank) are dropped, further particulars being filled in later from the A.F., A 36. Some units use metal discs instead of pieces of paper with the numbers of the wards stencilled on them; this involves a certain amount of trouble in looking after them, and in renewal without any special advantage. Next to the attached chart a similar one is placed

on which the name of the Medical Officer in charge of each ward is typed.

It is useful for the information of the drivers of the ambulances to have a box about 3 ft. long and 2 ft. high, with the number of the particular unit cut out, lined with tin and painted white inside, and placed on a stand about 5 ft. from the ground, and a small acetylene lamp (cost 9 francs) placed inside, and lighted shortly before the convoy is expected to arrive. It should be placed near the entrance of the reception tent and so placed that the drivers will be able to see the numbers distinctly at a considerable distance.

No. of ward	Vacant beds	Patients admitted	No. of ward	Vacant beds	Patients admitted	No. of ward	Vacant beds	Patients admitted
1		SS SS. III XX II XX	1			1		
2			2			2		
3			3			3		
4			4			4		
5			5	Dental		5		
6			6	Eye Ear Throat		6		
7			7			7		
8			8			8		
9			9					
10								
11	G.u.							

CASE OF SIMULTANEOUS BILATERAL FRACTURE OF PATELLÆ BY MUSCULAR TRACTION.

By Lieutenant J. ANDERSON.
Royal Army Medical Corps.

As this case is unique the following particulars are given :—

Driver J. C. A., aged 31, was admitted to the Connaught Hospital, Aldershot, June 20, 1915, with obvious fracture of both patellæ.

He stated he was practising for regimental sports and that at the time of the accident he was engaged in "hop, step and leap." At the

"hop" he stepped off on his right foot and as he landed he felt the right knee-cap give way. At the moment the left foot touched the ground the left patella also gave. At the time the accident occurred he heard "two cracks," one immediately after the other, and the sound he likened to the breaking of pieces of "dry wood." This occurred before either knee touched the ground.

The soil was soft sand, and there were no stones to fall on as the track had been specially prepared.

He had no pain immediately after the accident, but could not rise from the ground.

The clinical picture was the usual one found in such a condition, with considerable interval between the fragments. There is no family or previous history of bone disease, and patient is a healthy muscular man with large frame.

X-ray examination showed left side simple transverse fracture. Right side, a three-fragment fracture.

Treatment.—Transverse wiring.

Unusual points which justify record :—

(1) Almost simultaneous bilateral fractures by indirect violence.

(2) On one side the fracture was multiple.

Translation.

COMMUNICATION ON THE INTRODUCTION OF A REGULATED AMOUNT OF WINE INTO THE SOLDIER'S RATION.[1]

By M. E. MAUREL.

Correspondant National.

The Academy has already had three communications on this subject. At the sitting of June 29, 1915, my colleague, M. E. Vidal,[2] has, with his habitual ardour, advocated once more the importance of this step as a preventive of alcoholism; and M. Armand Gautier, who had already broached the subject before the Academy of Science on February 1, 1915,[3] took up the matter again in his masterly manner before our Academy at the sitting of July 6, 1915.[4] But, as he already had done at the Academy of Science, he further has enlarged the question by the

[1] Translated from *Bulletin de l'Académie de Médecine No.* 31, Séance au 3 août, 1915.

[2] La ration du vin aux soldats dans ses rapports avec l'alcoolisme (Séance du 29 juin, 1915, p. 784).

[3] Diététique : sur la ration du soldat en temps de guerre, t. clxix, 1 février, 1915.

[4] Dans la ration actuelle du soldat, il faut diminuer la viande et augmenter les légumes et le vin (Séance du 6 juillet, 1915, p. 5).

addition of some valuable observations on the ration as a whole. The title which he has chosen for his paper sums up very aptly the ideas which inspired him. Finally, at the sitting of July 13, 1915, M. Landouzy[1] taking up this to him familiar question of food allowance and applying it to troops, has demonstrated, *inter alia*, the desirability of replacing a certain amount of meat by wine, and also of varying the ration according to the build (of the soldier).

I am anxious to associate myself entirely with the conclusions of my colleagues. With M. Vidal, and for the same reasons, I agree that the moderate use of wine is a means of diminishing alcoholism, and with M. Gautier, I consider that the soldier's ration is too rich in meat, too deficient in vegetables, and stands to be improved by the addition of wine. Finally, I accept M. Landouzy's views on the variation in ration according to build and in the substitution of wine for a certain quantity of meat.

It is now some time since the rationing of the army,[2] considered broadly, has seemed to me capable of improvement in certain directions —some scientific, others practical.

In 1909 I drew attention to this in dealing with army rationing, and quite recently I returned to the subject before the Scientific and Literary Academy at Toulouse.[3] In this investigation, in addition to some general knowledge acquired on the subject of diet, especially in its relation to physical labour, I have made use of the results of certain experiments carried out by me in the preparation of my essay on "Diet and Sport" and in my investigations regarding expenditure of labour in swimming and cycling.

Perhaps I shall take up this work again for the Academy. For the present I shall limit myself to questions relative to *the introduction of wine into the soldier's ration*.

In 1909, in approaching the question of *table beverages*—wine, cider, perry[4] and beer—I first considered them collectively and discussed the four following questions:—

(1) Are these beverages necessary?

(2) Are they useful—or, more precisely, do they constitute foods?

(3) Are they dangerous?

(4) Under what conditions are they dangerous, and under what conditions may they be safely made use of?

Now, after sifting these questions, I summed up my conclusions as follows:—

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[1] Levin dans la ration du soldat; moyen de lutte contre l'alcoolisme. (*Bulletin de l'Académie de Médicine*, 13 juillet, 1915, p. 53.)

[2] Des troupes des deux armées.

[3] L'Académie des Sciences, Inscriptions et Belles Lettres de Toulouse.

[4] Poiré.

(1) During a meal the addition of some liquid to the solid foods is practically indispensable.

(2) This need not necessarily be a fermented liquor.

(3) Fermented liquors (taken under conditions now known) constitute true heat-energy-producing foods on account of their contained alcohol, and in this respect may be ranked with the starches and fatty foods.

(4) Under certain known conditions alcohol yields the same heat values *in vivo* as in the calorimeter.

(5) Under the same conditions, during both sleep and muscular work, alcohol replaces sugars and starches practically isodynamically (isodynamiquement).

(6) In these same conditions alcohol may be taken without danger.

(7) The conditions above referred to are as follows :—

(*a*) A maximum daily amount of one gramme per kilometre of body weight (about a quarter of an ounce per stone) should not be exceeded.

(*b*) The alcohol should be taken in a dilution not stronger than 10 per cent.

(*c*) The amount should be divided, not consumed all at one time.

(*d*) It is best taken at meals, not on an empty stomach.

(*e*) If taken between meals, it should be diluted down to 5 per cent or less.

(*f*) As far as possible it should be taken in the form of wine; or at least those liquors which contain the greatest quantity of noxious bodies, *i.e.*, propyl, butyl and amyl alcohol, should be avoided.

Such were the conclusions I came to in 1909 regarding fermented table beverages in general, or, more accurately, as regards their alcohol content. As concerning French wines particularly, I summed up my conclusions as follows :—

It is the alcohol of medium wines[1] which the organism most readily uses up, with heat production equivalent to that of a sugar, to the extent of at least 1 gramme per kilo body weight. Thus for a man of 65 kilos (10 st. 3 lb.) the amount is 65 grammes (2¼ fluid oz.) or about 1⅔ pints of wine containing 10 per cent of alcohol by volume.

Subsequent workers have confirmed these conclusions, notably Maignon, Batteh and Stern, Debove, Louis Jacquet, M. Nirloux and Placet, Maurice Nirloux, and Ivanov.

This general conclusion, most important and no less reassuring to our populace, has therefore been put beyond the range of doubt, viz.: *That the rich wine products of France, used under conditions fixed by the laws of hygiene, constitute a food of high nutritive value, which is cheap and free from risk.*

This result, important as it is to our general population, is equally

[1] Vins moyens.

applicable to the army, and it supports the opinions of Messrs. Vidal, A. Gautier, and Landouzy.

In the army the moderate use of wine, as Messrs. Vidal and Landouzy have pointed out, diminishes the risk of alcoholism; moreover, as M. A. Gautier has brought to notice, wine in such proportion has first of all a tonic action, and then constitutes a valuable source of heat and muscular-energy which has, thanks to its facile absorption, the advantage over other elements ternaires of diet of being utilized by the organism very shortly after its ingestion. To these advantages of wine I would add the following:—

(1) *That we find it at our doors.* (2) *That it is cheap.*

(1) As it is a product of France we have it at our immediate disposal and we can exercise surveillance over its manufacture. (2) As far as expense is concerned, its introduction into the soldier's ration (as M. Landouzy has already pointed out) so far from increasing the price, actually enables a substantial economy to be effected. It seems to me important to lay stress on this point.

The State can readily obtain from the wine-growers a wine of 10 per cent alcohol strength at 1s. 1½d. per gallon[1] or at least at the rate of 1⅜d. per gallon per degree of alcohol. At this price threepennyworth of wine will give 700 calories. Now, if as Messrs. A. Gautier and Landouzy insist *is necessary*, the amount of meat in the soldier's ration is reduced and its place taken by its dynamic equivalent in wine, the State will realize a substantial economy. In eliminating 3½ ounces of boneless meat, giving on average 200 calories, the price of the ration will be lessened by about 2½d. (0 fr. 25). Now wine will give the same number of calories at the cost of about 1d. (0 fr. 10). There will thus be an economy of 1½d. per ration, that is a saving of £12,000[2] a day where two million men have to be rationed.

Further, this substitution of wine for meat especially in campaigning rations is further justified by the following considerations:—

(1) The expenditure of albuminoids by the average man, even under conditions of considerable physical expenditure is not more than 3½ to 4 ounces (100 to 110 grammes), and in the campaigning ration about 5 ounces (140 grammes) of these bodies are present.

(2) The further expenditure due either to radiation from the skin or to muscular work is covered satisfactorily by the constituents of the ration (ternaire).

(3) Wine in the above proportions has the advantage over other constituents of the ration (ternaire) of being assimilable by the organism very shortly after ingestion.

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[1] A 30 francs l'hectolitre, ou du moins du bon vin dont l'alcool serait payé à 3 francs le degré.

[2] 300 mille francs.

Reviews.

Medical Hints, for the Use of Medical Officers Temporarily employed with Troops. By Colonel J. E. Squire, R.A.M.C.(V.). London: Henry Frowde, Hodder and Stoughton, 1915. Pp. 128.

Frankly we cannot think that Colonel Squire has been very careful of his reputation in publishing this compilation. The information given is elementary and the work abounds with irregularities and omissions. For instance, in the first part of the article on enteric fever we are told that the pulse is rapid, whilst, when dealing with the differential diagnosis, it is noted as being characteristically slow; nor, unless we are mistaken, do we expect to find a glazed and red tongue in the early stages of this disease, and when Widal's test is referred to, it would have been just as well to point out that inoculation vitiates the result.

In the treatment of amœbic dysentery surely the specific remedy emetine hydrochloride deserves mention, and hepatic abscess should have been mentioned as a complication.

The treatment of cerebro-spinal fever is neither definite nor clear, and a modern text-book should not refer to the injection of serum into the "vertebral column."

The articles on pulmonary diseases, the best in the book, are simple but exhaustive. But we quite fail to see how any person can advocate the retention of soldiers suffering from tubercle of the lung in the service. In dealing with cardiac lesions the most interesting and perplexing condition—disordered action of the heart—is practically ignored.

Prevention of disease, to which the writer makes reference in his preface, finds little space in the book. The standard attained in this primer is below the level of the others published by the same committee, and the book gives little assistance to medical officers doing regimental duty.

Cerebro-spinal Fever. By T. J. Horder, M.D. London: Henry Frowde, Hodder and Stoughton, 1915. Pp. 179. Price 3s. 6d. net.

If all the treatises on medicine and surgery are as excellent as the one under consideration, then the writers are to be congratulated, indeed, not only upon their foresight, but also upon the success which has attended their efforts. This is the first book in medical literature which deals exclusively with cerebro-spinal fever, and is to be cordially recommended to all medical men.

One needs to be a cavilling critic to find any fault with the book, but there are a few points which could and should be altered in time for the next edition. For example "West's Swab," which is shown in fig. 2 as being half-size, measures only three inches, which is hardly accurate. Again, it is a pity after devoting a whole chapter to the method of "lumbar puncture" to illustrate it by a photograph (fig. 2) showing this operation being performed too low for the space which is so definitely insisted upon. Further, since the author has been at great pains in the first chapter to select the name of "cerebro-spinal fever," it is strange to

find him occasionally referring to it (pages 49 and 86) as "meningococcus meningitis" (why not "meningococcal"?) and on page 76 as "cerebro-spinal meningitis."

The English and style are excellent throughout, although occasionally one stumbles upon long sentences of about seventy words, and such a sentence as the following, without any introduction, appears rather bald :—

Page 105, "VI is, as usual, most frequently involved, then III."

On page 116 the following statement will have to be corrected. In considering the diagnosis of typhoid fever, Major Horder remarks that "a positive blood-culture may *often* be obtained before the agglutination test is available."

If the word "always" be inserted for "often," then it will be more accurate.

The book is written in an extremely easy style, is very thorough, and absolutely complete, and cannot but prove invaluable; and in view of the widely spreading interest which is being evinced at the present time in this disease, its usefulness is apparent.

THE PRACTITIONER'S GUIDE TO CLINICAL RESEARCH. By the Clinical Research Association, Ltd., London. Pp. 149.

This book should prove of the greatest value to practitioners everywhere. The methods for collecting material and sending it to the pathologist are gone into in a most practical way. The clinical significance of the laboratory findings is carefully explained. The sections on the blood and cerebro-spinal fluid are particularly good, but all the sections are well worth careful study.

The book is to be thoroughly recommended.

An appendix at the end explains the cost of examinations of specimens by the Clinical Research Association.

Current Literature.

Lime Salts for Soldiers (from the *Scientific American*, vol. cxiii, No. 17, October 23, 1915).—The remarkable results obtained by the German physiologists, Emmerich and Loew, in their elaborate and extensive experiments with calcium salts as a factor in the diet of both men and animals, have aroused much attention in the past two or three years. The favourable results derived from the use of definite doses of lime salts are ascribed to the fact that calcium is an essential element, if not indeed the most important element which enters into the structure of the cell-nucleus of both animals and plants. This is why such marked debility is found where this element is insufficiently provided. Dr. Loew has recently been continuing his studies of the subject with reference to the use of calcium compounds in the diet of soldiers, whether wounded or well.

In an article contributed by him to the illustrated medical journal, *Hyg* (Munich), he declares that lime is peculiarly valuable in the diet of soldiers in the field, since its presence in the cell-nucleus in sufficient amount increases the organism's power of resistance to the chills and colds that are so often the starting point of serious maladies.

He maintains that lime salts in proper form and quantity work actual miracles. Among the wounded not only were injuries to the bone healed far more rapidly when the diet included a daily addition of 2 to 3 grm. of crystallized calcium chloride ($CaCl_2$), or 3 to 4 grm. of lactate of lime, but such addition usually hastened recovery in cases of other wounds not affecting the bones.

He recommends that at least "calcium bread," which is already much used in Germany, especially in Bavaria or South Germany, should be substituted for ordinary bread in the rations of soldiers engaged in active service.

The manufacture of this bread can be much simplified, it is stated, by the use of the so-called calcifarin flour. This is a compound of calcium chloride with flour, a sort of double compound which does not become damp when exposed to the air. In making the bread it is only necessary to mix five per cent of the "calcifarin" with the flour.

New Device for Treatment of Dislocated and Fractured Lower Limbs (from the *Scientific American*, vol. cxiii, No. 17, October 23, 1915).—A New York surgeon has recently perfected an apparatus designed to treat fractures to the lower limbs as soon as possible after they have occurred. The apparatus is especially intended to meet emergencies and complicated conditions. It may be employed in fractures, gunshot wounds, luxations and dislocations. It may serve as a temporary splint instead of a spica, or again, it may be employed as a permanent splint, depending upon the advisability of recumbent or ambulatory treatment.

The device consists essentially of two flat steel bars attached at their lower ends to a rectangular foot plate. To the external rod are riveted a series of from twelve to fifteen thin aluminium bands which are curved

to fit any lower limb around which they may be placed. The bands are fitted with straps so that they may be tightly held in place. By turning the bands 180° the apparatus may be placed on the other limb. An ingenious foot arrangement enables the patient using such a device to exert a tractive effort to a considerable degree without pain. The entire device weighs but 8 lb.

Briefly, the advantages of the new device may be summarized as follows: The limb is held in absolute immobilization, redression and traction; ambulatory treatment is possible; observation of callus, dressing, drainage, massage and electrical treatment are possible, without removing the splint or lessening the traction; the apparatus is light and compact and can readily be made a part of any ambulance equipment; very little skill is necessary to apply it; practicability in post-operative treatment instead of spicas; and, lastly, it does not interfere with X-ray examinations.

A Study of the Germicidal Action of the Ultra-violet Rays.—E. M. Houghton, M.D., and Lewis Davis, M.S. (Collected papers from the Research Laboratory. Parke, Davis and Co., Detroit, Michigan.)—The authors in their work used a Cooper-Hewitt standard type Y lamp non-immersed type. Liquids were exposed to the rays in a special rectangular trough 15½ cm. by 4 cm. divided into two equal portions by a central septum. After flowing through one side the liquid passed back to the other side by means of a diagonal tube which thus subjected it to a second exposure to the rays.

In most of the work on water the liquid was exposed to the rays in a special bent quartz tube.

(1) Tap water with considerable matter in suspension and having a bacterial content of 800 organisms per c.c. can be sterilized by exposure to ultra-violet rays in a quartz tube at a rate as high as a litre in thirty-eight seconds.

If the rate of flow was reduced to one litre in forty minutes the temperature rose 34° C. giving a final temperature of 60° C.

(2) *Aqueous Suspensions of Bacteria.*—Various aqueous suspensions of *Bacillus coli communis* ranging from 80,000 colonies per c.c. to 750,000 per c.c. were exposed to ultra-violet light at different rates of flow up to a litre in forty-two seconds.

In each case 5 c.c. samples plated out on agar showed no colonies when incubated for three days at 37° C.

B. subtilis with spores was used in a similar series of experiments, 200,000 bacilli per c.c. Complete sterility was obtained even with a rate of flow of one litre in thirty-nine seconds.

(3) *Beef Bouillon.*—It was not found possible to sterilize cultures of *B. coli* in broth even when the rate of flow was as slow as one litre in ten minutes.

(4) *Bismarck Brown.*—Water coloured with Bismarck brown was used; this fluid was infected with *B. coli* and run through at a rate of one litre per minute. Complete sterilization took place showing that the failure of the previous experiment was not due to the colour of the medium but due to the presence of proteins and other bodies of high molecular weight.

(5) *Sodium Chloride.*—Aqueous solutions of common salt in strengths

of 1 per cent, 2 per cent, and 4 per cent, containing as high as 450,000 colonies per c.c. were exposed to the rays. The highest rate of flow was a litre per minute.

In every case 5 c.c. samples of the liquid after exposure failed to show any organisms present. A 4 per cent solution of saccharose was also employed with a like result.

The ultra-violet rays were found to have little or no action on moulds. It was also found that the ultra-violet rays cannot be successfully employed for the sterilization of milk.

To sterilize bacterial vaccines it is necessary to pass the liquid slowly, a flow of about a litre in eight minutes is most satisfactory.

The vaccines must first be shaken to remove clumps. A staphylococcus vaccine of 500,000,000 per c.c. was sterilized in this way.

JOURNAL

OF THE

ROYAL ARMY MEDICAL CORPS.

Corps News.

September, October and November, 1915.

War Office,
November 8, 1915.

The President of the French Republic has been pleased to confer the decoration of the Legion of Honour on the undermentioned officer, with the approval of His Majesty the King, for distinguished service in the Field:—

Croix de Commandeur.

Surgeon-General Sir Arthur Thomas Sloggett, K.C.B., C.M.G., K.H.S.

The King has been graciously pleased to give directions for the following appointments to the Most Distinguished Order of St. Michael and St. George, for distinguished service in the Field during the operations at the Dardanelles:—

To be additional members of the Third Class, or Companions, of the said Most Distinguished Order:—

Australian Imperial Force.

Colonel The Honourable Joseph Livesley Beeston, Army Medical Corps.

New Zealand Imperial Force.

Lieutenant-Colonel Charles Mackie Begg, New Zealand Medical Corps.

War Office,
November 4, 1915.

His Majesty the King has been graciously pleased to approve of the appointment of the undermentioned officers to be Companions of the Distinguished Service Order, in recognition of their gallantry and devotion to duty in the Field:—

Major Geoffrey Wallace Grainger Hughes, 6th Cavalry Field Ambulance, Royal Army Medical Corps.

For conspicuous ability and good work in arranging for the care and evacuation of the wounded at Loos on September 26 and 27, 1915. A large number of wounded infantry were tended and evacuated by the two cavalry field ambulances in addition to wounded cavalrymen. During the greater part of the time Loos was under heavy bombardment.

Captain Whiteford John Edward Bell, M.B., No. 2 Field Ambulance, Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty on all occasions, notably near Loos, between September 28 and October 1, 1915, when he visited the advanced bearer post day and night under continuous shell fire and personally supervised the arrangements for collecting and evacuating the wounded in that area. Captain Bell has commanded a bearer division since August, 1914.

Captain (temporary Major) John Wilfred Bird, 6th London Field Ambulance, Royal Army Medical Corps, Territorial Force.

For conspicuous devotion to duty during operations at Maroc and Loos, between September 25 and 30, 1915, in dealing with casualties. On one occasion he worked

for twenty-three hours without any cessation in dressing and tending the wounded. He set a fine example, which had far-reaching results.

Temporary Captain Charles Stewart Parnell Hamilton, Royal Army Medical Corps, attached 2nd Battalion, The Buffs (East Kent Regiment).

For conspicuous gallantry and devotion to duty from September 27 to 30, 1915, in France. He dressed the wounded in the firing line, being for hours together under heavy shell fire, and went to points of great danger, often to where bombers were actually fighting.

Captain Frank Robinson Kerr, M.B., Royal Army Medical Corps, Special Reserve.

For conspicuous gallantry and splendid devotion to duty at Guinchy on September 25, 1915. After an unsuccessful attack on the enemy's trenches, this officer crawled over our parapet and brought in a wounded man from about a dozen yards outside in full view of the enemy at a range of only seventy yards. He then went out again for thirty yards and rescued a man whose thigh had been broken, being fired at the whole time.

During the night of September 25, Captain Kerr was out attending to the wounded for two hours under constant machine-gun and rifle fire, and on the night of September 27-28 he went to within twenty-five yards of the enemy's position to rescue a man reported wounded, but found that he was dead.

Captain Arthur John Alexander Menzies, M.B., Royal Army Medical Corps, attached 1st (Royal) Dragoons.

For conspicuous gallantry and devotion to duty from September 26-29, 1915, in Loos. Captain Menzies was unremitting in his attention to the wounded of all units. He was twice seen carrying wounded on a stretcher under rifle fire, and for fifty-five hours he was continually exposing himself to heavy shell fire while carrying out his duties.

His Majesty the King has been graciously pleased to confer the Military Cross on the undermentioned officers, in recognition of their gallantry and devotion to duty in the Field: –

Captain Frank Percy Freeman, Royal Army Medical Corps, Special Reserve, attached 23rd Field Ambulance.

For conspicuous gallantry and devotion to duty during operations near Hulluch, from September 25 to 28, 1915. He brought in and attended to the wounded during four consecutive days and nights, repeatedly going out under heavy fire. By his personal bravery and energy he set a splendid example to his men.

Captain James Ronald McCurdie, M.B., Royal Army Medical Corps, Special Reserve, attached No. 2 Field Ambulance.

For conspicuous gallantry and devotion to duty from September 25 to 27, 1915, at Le Rutoire farm, where, although continuously exposed to shell fire, he collected and treated the wounded. By his efforts and organizing power a large number of wounded were collected. Captain McCurdie set a fine example to the officers and men under him in most trying circumstances.

Temporary Captain James Murray McLaggan, M.B., Royal Army Medical Corps, attached 3rd Battalion, The Royal Fusiliers (City of London Regiment).

For conspicuous gallantry and devotion to duty during the operations between September 27 and 30, 1915, when he attended to the wounded in the firing line under heavy shell and rifle fire. His coolness and skill undoubtedly saved many lives. For three days and four nights he worked incessantly with unflagging energy.

Temporary Captain Charles Joseph O'Reilly, M.D., 21st Field Ambulance, Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty during operations near Hulluch, from September 25 to 28, 1915. He brought in and attended to the wounded for four consecutive days and nights under heavy fire, notably on September 27, when he voluntarily went out to collect wounded under very heavy shell fire. He has consistently set a splendid example to his men.

Captain Thomas Walker, M.B., Royal Army Medical Corps, Special Reserve, attached No. 2 Field Ambulance.

For conspicuous gallantry and devotion to duty, from September 25 to 27, 1915, when he worked continuously collecting wounded from the area, Long Tree to Hulluch Road, and beyond. This area was under continuous shell fire, and at first under machine-gun fire also.

Temporary Lieutenant David Carnegie Alexander, M.B., Royal Army Medical Corps, attached 5th Battalion, The Queen's Own Cameron Highlanders.

For conspicuous gallantry and devotion to duty between September 25 and 27, 1915, near "Fosse 8." He attended to and got into shelter many wounded men who were

lying in the open under enfilade machine-gun fire, and on several occasions at the manager's house at the Fosse carried out his duties under heavy shell fire.

Temporary Lieutenant John Bruce Baird, No. 1 Field Ambulance, Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty from September 25 to 27, 1915, when in charge of different bearer sections collecting wounded in the area between Lone Tree and Hulluch Road under shell and machine-gun fire.

Temporary Lieutenant George Rankine, M.B., Royal Army Medical Corps, attached Headquarters, 9th Divisional Royal Engineers.

For conspicuous gallantry and devotion to duty, from September 26 to 28, 1915, at Sailly and Vermelles, when attending to and evacuating the wounded. On one occasion he went with a party of bearers as far as Hohenzollern Redoubt, and, in spite of shell fire and bombing, assisted to get back many wounded. On the return journey many of the bearers were killed and wounded by a shell, and Lieutenant Rankine carried in a wounded man on his back.

Temporary Lieutenant Bernard Score Browne, M.B., Royal Army Medical Corps, attached 2nd Battalion, The Cheshire Regiment.

For conspicuous gallantry and devotion to duty near Vermelles. He spent the whole night of October 2 and 3 searching for and carrying back wounded who were lying between our own and the enemy's lines, which were only 200 yards apart. The enemy were firing and the ground was lit up by flames. After daybreak he carried back three more men under a very heavy fire. At one time he tended the wounded within 15 yards of the enemy's trenches. By his courage and ceaseless work all the wounded in his area were brought in.

War Office,
London, S.W.,
November 5, 1915.

The following despatch has been received by the Secretary of State for War from the Commander-in-Chief, Mediterranean Expeditionary Force.

General Headquarters,
Mediterranean Expeditionary Force,
September 22, 1915.

My Lord, In continuation of my despatch of August 26, 1915. I have the honour to submit herewith the following additional names of officers, non-commissioned officers and men whose services, during the operations described therein, I consider deserving of special mention.

I have the honour to be,
Your Lordship's most obedient servant,
(sd) Ian Hamilton,
General, Commander-in-Chief,
Mediterranean Expeditionary Force.

Staff.

Lieutenant-Colonel A. E. C. Keble, Royal Army Medical Corps.
Captain J. Hare, M.B., Royal Army Medical Corps.

Royal Army Medical Corps.

Lieutenant-Colonel L. Humphry.
Major A. McMunn.
No. 10431 Serjeant-Major H. Underwood.
No. 16177 Serjeant-Major A. F. Robinson.
No. 1643 Serjeant F. H. Mattock.
Major E. McDonnell, M.B.
No. 2166 Serjeant W. T. Mathias.
No. 31656 Serjeant B. T. Colls (dead).
No. 19254 Acting-Serjeant G. A. Scales.

Royal Army Medical Corps (T.F.)

Lieutenant-Colonel J. J. O'Hagan, T.D., M.B., F.R.C.S.I., West Lancshire Field Ambulance.
No. 223 Corporal R. Pain, attached Lancashire Fusiliers.
No. 1554 Private W. E. Lloyd, 88th Field Ambulance.
No. 407 Private G. A. Walton, East Lancashire Field Ambulance.
No. 149 Private H. Price, East Lancashire Field Ambulance.
No. 155 Private J. Morris, East Lancashire Field Ambulance.

AUSTRALIAN AND NEW ZEALAND FORCES.

Staff.

Colonel N. Manders, Army Medical Service (killed).

INDIAN MEDICAL SERVICE.

Captain T. J. C. Evans, F.R.C.S.

ARMY MEDICAL SERVICE.

Lieutenant-Colonel Hugh S. Thurston, C.M.G., to be temporary Colonel whilst holding the appointment of Assistant Director of Medical Services, dated October 3, 1915.

ROYAL ARMY MEDICAL CORPS.

David White Finlay, M.D., to be temporary Honorary Lieutenant-Colonel whilst holding the appointment of officer in charge Red Cross Hospital at Ballahouston, Glasgow, dated November 9, 1915.

Arthur Frederick Hertz, M.D., F.R.C.P., to be temporary Major, dated October 26, 1915.

The appointment to a temporary Lieutenancy of Fraser B. Gurd, M.D., is antedated to May 25, 1915.

Temporary Honorary Lieutenant Everard William Lewen Sharp to be temporary Lieutenant, dated September 27, 1915 (substituted for the notification which appeared in the *Gazette* of October 16, 1915).

The transfer of Captain Edward P. Minett from 6th London Field Ambulance, which was announced in the *London Gazette* of January 18, 1915, is cancelled.

The undermentioned to be temporary Captains:—

Dated June 2, 1915.—Captain Eric Leonard Dobson, Honourable Artillery Company, Infantry, Territorial Force.

Dated October 7, 1915.—Temporary Lieutenant John N. Clark.

Dated October 9, 1915.—John Henry Jones, late Staff Surgeon, Royal Navy.

Dated October 10, 1915.—Malcolm Ferguson.

Dated October 11, 1915.—Harry Meade, F.R.C.S.I.; Thomas Andrew Rothwell, M.D., late Surgeon Captain, 3rd Volunteer Battalion, the Cheshire Regiment.

Dated October 28, 1915.—Temporary Lieutenant William G. Brett.

Dated November 10, 1915.—Temporary Lieutenant Alexander Waugh, M.B.

The undermentioned temporary Lieutenants to be temporary Captains:—

Dated September 19, 1915.—Edward Hamilton.

Dated October 1, 1915.—Eric F. W. Mackenzie, M.B.; Thomas E. Lawson; Frank E. Johnson; William MacEwen, M.B.; Philip H. Bahr, M.D.

Dated October 2, 1915.—Charles G. L. Wolf, M.D.; Clayton C. Morrell, M.D.; James Biggam, M.B.; Cuthbert Scales, M.B.; David Pottinger, M.B.; Leslie W. Howlett, M.B.; David Hardie, M.B.

Dated October 3, 1915.—Richard H. C. Gompertz, M.B.; Arthur B. Le Mesurier, M.B.; William A. Todd, M.B.; John McFadden, M.B.; Robert B. Blair, M.B., F.R.C.S.Edin.; Philip J. Watkin; Matthew Murphy; William R. MacKenzie.

Dated October 5, 1915.—Charles M. Kennedy, F.R.C.S.; Delvine Bell, M.B.; Edwin B. Barton, M.B.; John S. K. Boyd, M.B.; Douglas M. Borland, M.B.; William S. Garden, M.D.; John H. C. Green, M.B.; Aubrey Goodwin, M.B.; Stanley Honeyman, M.B.; Robert McC. Hill, M.B.; Alfred E. Hallinan, M.B.; Thomas H. Houston, M.B.; Courtnay C. Keates; David Matthew, M.B.; William S. Martin, M.B.; Henry M. MacKenzie, M.B.; Fred W. Mackenzie, M.B.; John T. Morrison, M.B., F.R.C.S.; Hugh L. Neil, M.B.; Ralph S. Oldham, M.D.; William B. U. Patterson, M.B.; George Rankine, M.B.; William R. Snodgrass, M.B.; James J. Sinclair, M.B.; James Taylor, F.R.C.S.Edin.; James H. Grove-White, M.D.; Donald Wainwright; Wilfred T. Chaning-Pearce, M.B.

Dated October 7, 1915.—Francis F. Muecke, M.B., F.R.C.S.

Dated October 8, 1915.—Arthur O. P. Reynolds, M.B.; Stanley Pinion, M.B.

Dated October 9, 1915.—Albert J. Best; William K. Calwell, M.B.; Hugh G. Wilson, M.B.; Douglas G. Cheyne, M.D.; Samuel E. Picken, M.B.; John L. Dunlop.

Dated October 10, 1915.—Robert H. Spittal, M.B.; Hubert W. Powell; Edward A. Walker, M.D.; Thomas S. Wright, M.B.; Ernest White, M.B.; Edward C. Gimson, M.B.; William E. Wallis, M.B.; William W. Forbes; Robert Kennon, M.D.; Francis E. Daunt, M.B.; David J. S. Stephen, M.D.; Philip A. Opie, M.B.; Charles G. Timms; Edgar Grey, M.B.; John Fleming, M.B.; Gordon S. Woodman, M.B.;

John P. Davidson, M.B.; William P. Hogg, M.B.; George Wilson, M.B.; John Scott, M.B.; James W. McLeod, M.B.; Bryce McC. Smith, M.B.; Lewis Anderson, M.B.; Henry G. Rice; David R. E. Roberts, M.B.; Ernest N. Snowden, M.B.; Kenneth G. Fraser; John S. Levis. M.B.; David R. Mitchell, M.B.; Denis J. Stokes, M.B.; Charles M. Smith, M.B.; John McL. Pinkerton, M.B.; William C. Douglass; Alan Wilson, M.B.; Malcolm K. Acheson, M.D.; Alexander Anderson, M.B.; Karl K. G. Dick; William G. Gordon, M.B.; John E. Staccy, M.B.; John V. O. Andrew; John Spence, M.B.; John P. Cahir, M.B.; Ernest F. C. Dowding; Thomas P. Cole, M.B.; John Parkinson, M.D.; John H. McNicol, M.B.; Reginald J. Wooster; William MacKenzie, M.B.: Edward W. Alment; Cedric R. Taylor, M.B.; Douglas W. Hunter, M.B.; James S. Somerville, M.B.; Thomas P. Lewis; Claude G. Douglas, M.D.; John W. Flood; Ralph F. Eminson, M.B.; William E. Hopkins, M.B., F.R.C.S.I.; Robert B. Wallace, M.B.; William B. Watson, M.B.; John Capell; Spencer Jackson, M.B.; Stanley Fenwick, M.B.; William E. Fetherstonhaugh, M.B.; John M. Forsyth, M.B.; Alexander E. Drynan, M.B.; Archibald S. K. Anderson, M.B.; James W. Brown; David S. Harvey, M.B.; Edward F. G. T. Heap; George Millar, M.B.; John Henderson, M.B.; Lawrence F. Hemmans, M.B., F.R.C.S.Edin.; William Baxter, M.B.; Thomas W. R. Strode; Newton Matthews, M.B.

Dated October 12, 1915.—Tremlett B. Batchelor; Noel A. Coward, M.D.; Ranald M. Handfield-Jones; John G. Ingouville; Michael J. Mulligan, M.B.; Michael Murphy, M.B.; George W. Milne, M.D.; Humphrey Neame, F.R.C.S.; Vivian M. Rich, M.B.; Edward L. N. Rhodes; George Thom; John Tichborne, M.D.; George W. Will, M.B.; Alfred S. Taylor, M.B.

Dated October 13, 1915.—William G. Lidderdale, M.B.

Dated October 14, 1915.—Magnus R. Mackay, M.B.

Dated October 15, 1915.—Frank A. Grange, M.B.; John D. Lithgow, M.B., F.R.C.S.Edin; James A. Smith, M.B.; Malcolm W. Shutte.

Dated October 16, 1915.—John W. Dew, M.B.

Dated October 17, 1915.—John H. D. Acland; Henry A. Ehrlich; Robert C. Irvine, M.B; Douglas E. Crosbie.

Dated October 19, 1915.—Herbert T. Retallack-Maloney; Arthur F. Palmer; Percy J. Chissell.

Dated October 20, 1915.—Claude Kingston.

Dated October 21, 1915.—William H. Brown, M.D.; Joseph H. Campian, M.B.; Gerald Cock; Walter J. I. Dwyer; Sydney H. Gibson; John C. B. Grant, M.B., F.R.C.S.Edin.; Alexander K. Hamilton, M.B.; Albert G. Miller, M.B.; Alexander T. McWhirter, M.B.; Patrick J. O'Reilly; John A. Pringle, M.D.; Edmund G. C. Price, M.B.; Thomas T. Rankin, M.D.; Percy C. Raiment; Ronald J. T. Thornhill, M.B.; Henry A. Treadgold, M.D.; Alfred W. Weston, M.B.; William M. Will, M.B.; John J. Walsh; William S. Milne, M.B.; Joseph G. Johnston, M.B.; George W. Rea, M.B.

Dated October 22, 1915.—Richard Charles, F.R.C.S.I.; Henry C. C. Rennie, M.B.; John H. O'Neill.

Dated October 23, 1915.—Arthur de W. Snowden, M.D.

Dated October 24, 1915.—Michael J. Kelly; Arthur G. Leitch; William W. Mackarell, M.D.; John B. Orr, M.B.; Maurice P. Scanlon, M.B.; Ernest A. Tozer, M.B.; John C. Anderson, M.D.; Alfred J. Andrew.

Dated October 26, 1915.—John MacInnes, M.B.; Herbert Emerson, M.B.

Dated October 29, 1915.—Robert L. Brown; Winslow S. S. Berry, M.B.

The undermentioned to be temporary Lieutenants:—

Dated June 8, 1915.—Alexander Brown, M.B.

Dated July 6, 1915.—Temporary Lieutenant Harold Parsons, M.B., from the Army Service Corps.

Dated August 1, 1915.—Charles Richard Maitland Pattison.

Dated September 12, 1915.—Harry Butson Maunsell.

Dated October 4, 1915.—Allan Semple, M.B.

Dated October 7, 1915.—John Henry Morris-Jones; Robert Chichester McMillan, M.B.

Dated October 9, 1915.—Seymour Whitney Davies, M.B.; Timothy Joseph Lloyd; Arthur John Brock, M.D.; Rupert Allen Clayton Rigby; Francis Joseph McGlade, M.B.; Charles Herbert Farley Johnston, M.D.; Charles Edwin Durrant; Charles Michael Roberts, M.B.; William Melville Christie, M.B.; Charles Samuel Kingston; Alexander Moxon Webber, F.R.C.S.

Dated October 10, 1915.—Arthur William Courtney Drake, M.B.; Rufus Clifford Thomas; Thomas McCall Sellar, M.B.; William Robert Wilson, F.R.C.S.I.; Pollok Donald, M.B.; Thomas Arthur Collinson; William Gillespie Bryson Gunn, M.B.; William O'Donnell; William Watt Farrar, M.B.

Dated October 11, 1915.—Samuel Wilson McComb, M.B.; Richard Robert Kirwan, M.B.; Robert Charles Muir, M.B.; William James Macdonald, M.B.; John Black, M.B.; Alwyne Harold Manfield; Cecil Granville McClymont; James Percival Scatchard, M.B.; Alban Dixon; Henry Robert Ramsbotham, M.B.; Victor Albert Chatelain, M.B.; James Batson Stephens, M.B.; John Williamson Frew, M.B.; Basil Henry Palmer, M.B.; John Norman Lonsdale Thoseley, M.B.; Alexander Graham Bryce, M.D.; Arthur Borland Porteous, M.B.; George Unsworth, M.B.

Dated October 12, 1915.—John Fletcher Strickland, M.B.; Nathaniel Troughton Bond, M.B.; Alexander Dingwall, M.B.; John Walter Burnett Thornburn, M.B.; Benjamin Poyntz Young; Malcolm McLean Morrison, M.B.; Charles Aloysius Keegan, M.B.; Arthur William Wakefield, M.D.; William Joseph Maloney, M.B.; Eric Wesley Thomas; Alfred Fisher Camp; Gwilym Tremain Davies.

Dated October 15, 1915.—Robert Robertson Kilpatrick, M.B.; Arthur Denison, M.D.; John Joseph Michael Dowzer; Thomas William Jackson, M.B.; Donald Frederick Dobson, M.B.; John Campbell Smith, M.B.; Harold Topham; William Douglas Anderson King, M.B.; George Norman Kirkwood, M.B.; John Miller, M.B.; John Wilson Mathie, M.D.; Arthur John Partridge, M.B.; Frederic Ritchie, M.B.; William Gerald Parkinson, M.B.; Walter Johnstone McKeand, M.B.; Cecil Alfred Dottridge, M.B.; Wilfred Robert Burton; John Frank William Waters; Robert Edward Smith; William Eardley, M.B.; George Blair, M.B., F.R.C.S.Edin.; Samuel Francis Allen Charles, M.D.; Thomas Macmillan Anderson, M.D.; George Cowley Gell; John Edward Thompson, M.B.; John Aloysius Pierse, M.B.; Robert Sidney Ellis, M.B.; William George Thomas Hepplewhite, M.D.; Ernest James Maxwell, M.B.; John Ownsworth Garland; temporary Honorary Lieutenant Frederick William Watkyn-Thomas; John Ambrose Whitaker; John Duguid; William Harold Waldman; Sidney John Vaughan Cox-Moore.

Dated October 16, 1915.—Francis James Browne, M.B., F.R.C.S.Edin.; Thomas Muir Crawford, M.B.; George Stevenson Gordon, M.B.; Stevenson Plumbe Moore, M.B.; William Beatson Drummond, M.B.

Dated October 17, 1915.—John Charsley Mackwood; James Joseph Reynolds; Edward Geake Lane.

The undermentioned to be temporary Honorary Lieutenants:—

Dated July 24, 1915.—James Reid Dick, M.B., whilst employed with No. 1 British Red Cross (Duchess of Westminster's) Hospital.

Dated October 21, 1915.—James Stuart Leslie.

The undermentioned temporary Honorary Lieutenants to be temporary Lieutenants:—

Dated October 9, 1915.—Thomas Burges Welsh, M.B.; Alfred Noel Garrod; John Llewellyn Davies; Andrew Hunter Little; William Frank Thompson.

Dated October 24, 1915.—Robert Joel Cazalet Donty whilst serving with No. 2 British Red Cross Hospital.

The undermentioned Lieutenants of the Canadian Army Medical Corps to be temporary Lieutenants:—

Dated October 4, 1915.—Thomas John Simpson, M.B.; John George Moore Sloane, M.B.; Cecil John Sparrow, M.D.; Michael Joseph Casserley, M.D.; Arthur Clifford Johnston, M.D.

The undermentioned temporary Captains relinquish their commissions:—

Dated October 3, 1915.—Mark C. Gardner, M.B.

Dated October 5, 1915.—Godfrey M. Huggins, F.R.C.S.

Dated October 30, 1915.—Arthur Matthey.

The undermentioned temporary Lieutenants relinquish their commissions:—

Dated September 19, 1915.—Albert Turner.

Dated October 2, 1915.—George C. Adeney, M.B., F.R.C.S.

Dated October 5, 1915.—Edmund R. Dermer; Charles D. Roberts; Dudley T. Birt; Alan W. Gaye, M.B.; James W. Littlejohn, M.D.; Neil F. Sinclair.

Dated October 6, 1915.—John H. Sheldon, M.B.

Dated October 7, 1915.—Ernest W. Milne, M.B.; David Riddell, M.D.

Dated October 9, 1915.—John Hewat, M.B.

Dated October 10, 1915.—William P. H. Munden, M.D.; James Fraser, M.B.; Patrick K. Murphy, M.B.; Reginald W. Gemmell, M.B.; James G. Copeland, M.B.;

James H. Connolly, M.D., F.R.C.S.; Christopher Elliott; Henry D. H. Willis-Bund; Francis F. Brown, M.B.

Dated October 12, 1915.—John Davidson, M.B.

Dated October 13, 1915.—Adam Gray, M.D.; Robert S. Taggart, M.B.

Dated October 21 1915.—Victor L. Connolly, M.B.; Douglas F. Kennard; Frederick G. Norbury; John T. W. Stewart, M.B.; Alexander Stephen, M.B.; George H. Urquhart, F.R.C.S.Edin.

Dated October 22, 1915.—James L. Whatley.

Dated October 24, 1915.—David N. Knox, M.B.; Andrew R. Hamilton, M.B.; Evan W. Griffith.

Dated October 25, 1915.—Horace C. Barr.

Dated October 28, 1915.—Thomas H. Agnew.

Dated October 30, 1915.—William S. Stevenson.

Dated October 31, 1915.—John B. Wood, M.B.

Temporary Honorary Lieutenant Andrew F. H. Rabagliati, M.D., relinquishes his commission on ceasing to be employed with No. 4 British Red Cross Hospital, dated October 24, 1915.

The undermentioned to be temporary Quartermasters, with the honorary rank of Lieutenant:—

Dated October 21, 1915.—Arthur Percy Groves.

Dated October 23.—Edward Ezra Larner.

Dated October 25, 1915.—Walter Pryce Clifford Thomas.

Dated October 27, 1915.—Samuel Pitchford.

Dated November 1, 1915.—Frederick Leaf.

SPECIAL RESERVE.

Royal Army Medical Corps.

The undermentioned Lieutenants to be Captains:—

Dated October 1, 1915.—Gavin Young, M.B.; Peter MacCullum, M.B.

Dated October 5, 1915.—James S. Robinson, M.B.

Dated October 7, 1915.—Robert Forgan, M.B.

Dated October 10, 1915.—James O'Brien; Forster H. B. Norrie, M.B.; Robert B. Myles, M.B.; Gilbert W. Rose, M.B.

Dated October 14, 1915.—Douglas Cran, M.B.; Robert McKinley, M.B.; William B. Postlethwaite, M.B.; John O. Reid, M.B.; Patrick C. MacRae, M.B.

Dated October 16, 1915.—John McC. Orme, M.B.

Dated October 17, 1915.—Ian C. Mackay, M.B.

Dated October 19, 1915.—Henry P. Crow, M.B.; William B. Cathcart, M.B.; Frederick E. Feilden.

Dated October 20, 1915.—Neville H. Linzee.

Dated October 21, 1915.—Robert P. S. Mason.

Dated October 23, 1915.—Austin B. Clarke, M.B.; Thomas Young, M.B.

Dated October 24, 1915.—John F. Lyons; James G. Wilson, M.B.; Alfred T. Logan, M.B.

Dated October 26, 1915.—Raymond F. Pinson.

Dated October 30, 1915.—Robert Taylor.

The undermentioned Lieutenants (on probation) are confirmed in their rank:—

Maurice B. King, M.B.

Roland H. Graham, M.B.

Dated October 27, 1915.—John Bernard Cavenagh, M.B.

TERRITORIAL FORCE.

Royal Army Medical Corps.

1*st London (City of London) Field Ambulance.*—Captain Arthur D. J. B. Williams relinquishes his commission on appointment to the permanent Staff of the British East African Protectorate, dated August 15, 1915.

1*st London (City of London) General Hospital.*—The surname of Captain Joseph F. Trewby is as now stated, and not as announced in the *London Gazette* of September 4, 1914.

1*st London Casualty Clearing Station.*—Lieutenant Cecil A. Robinson to be Captain, dated October 10, 1915.

2*nd London (City of London) Field Ambulance.*—Serjeant-Major John James, from 3rd London (City of London) Field Ambulance, to be Quartermaster, with the honorary rank of Lieutenant, dated November 6, 1915.

2nd London (City of London) General Hospital.—The following announcement is substituted for that which appeared in the *London Gazette* of October 2, 1915: Frederick Douglas Selmes Jackson to be Captain, whose services will be available on mobilization, dated October 3, 1915.

2nd London Sanitary Company.—John Inglis to be Lieutenant, dated October 30, 1915.

3rd London General Hospital.—Lieutenant Roger P. Ninnis, M.B., resigns his commission on account of ill-health, dated November 14, 1915.

5th London Field Ambulance.—Lieutenant Robert W. Baron, M.B., resigns his commission on account of ill-health, dated November 9, 1915.

6th London Field Ambulance.—The following announcement is substituted for that which appeared in the *London Gazette* of September 13, 1915: Captain Edward P. Minett is restored to the Establishment, dated August 16, 1915.

Highland Casualty Clearing Station.—Lieutenant James Davidson, M.B., to be Captain, dated October 23, 1915. The undermentioned Lieutenants to be Captains, dated October 25, 1915: Joseph E. Milne, M.D.; Charles Forbes, M.B.; Alexander J. Presslie, M.B.; James McL. Macfarlane, M.D.; Alexander Fraser McBean, M.B., to be Lieutenant, dated October 22, 1915.

Highland Mounted Brigade Field Ambulance.—Ronald William Cadell Macdonald, M.D. (late Surgeon-Lieutenant, 8th Volunteer Battalion, The Royal Scots), to be Captain, dated September 26, 1915.

1st Lowland Field Ambulance.—Lieutenant Frank M. Robertson, M.B., to be Captain, dated October 19, 1915.

2nd Lowland Field Ambulance.—Lieutenant William J. Scade, M.B., to be Captain, dated October 19, 1915. William Goldie, M.B. (late Lieutenant, 6th Battalion, The Royal Scots), to be Lieutenant, dated November 14, 1915.

1st Northern General Hospital.—The undermentioned Lieutenants to be Captains: William Stott, M.B., dated October 14, 1915; Thomas Whitelaw, M.B., dated October 20, 1015. Captain Wilfred E. Alderson, M.D., from attached to units other than medical units, to be Captain, whose services will be available on mobilization, dated November 6, 1915.

3rd Northern General Hospital.—Nathan Judah Wigram to be Lieutenant, dated October 14, 1915. Alfred Ernest Turnell (late Quartermaster and Honorary Lieutenant, 4th West Yorks Royal Engineers (Volunteers)), to be Quartermaster, with the honorary rank of Lieutenant, dated October 14, 1915.

4th Northern General Hospital.—Captain Arthur A. Pratt, M.D., is seconded for duty with a Casualty Clearing Station, dated October 27, 1915.

Northumbrian Casualty Clearing Station.—The undermentioned Lieutenants to be Captains, dated September 29, 1915: Fred Phillips, M.B.; Stanley McCoull, M.B.

2nd West Riding Field Ambulance.—The date of promotion of Lieutenant Wallace W. Adamson, M.B., is April 1, 1915, and not as stated in the *London Gazette* of October 12, 1915.

3rd West Riding Field Ambulance.—The date of promotion of Lieutenant Ernest White to Captain is April 1, 1915, and not as stated in the *London Gazette* of September 20, 1915.

1st South Midland Mounted Brigade Field Ambulance.—The date of appointment of Lieutenant Samuel Percy Johnson, M.B., is September 24, 1915, and not as stated in the *London Gazette* of October 1, 1915.

1st South Midland Field Ambulance.—Lieutenant Edmund Whichello, M.B., to be Captain, dated October 16, 1915.

3rd South Midland Field Ambulance.—The appointment of David McVea Fleck, M.B., as Lieutenant, which was announced in the *London Gazette* of April 19, 1915, is cancelled.

North Midland Mounted Brigade Field Ambulance.—The following announcement is substituted for that which appeared in the *London Gazette* of July 6, 1915: Lieutenant Lionel A. Dingley, M.B., to be Captain, dated April 1, 1915.

East Lancashire Casualty Clearing Station.—Captain Thomas B. Wolstenholme, M.B., to be temporary Major, dated November 6, 1915.

3rd East Lancashire Field Ambulance.—Frederick William Marsden (late Major, 2nd East Lancashire Brigade, Royal Field Artillery) to be Major, dated October 27, 1915. Major Robert C. Rodgers, 5th Battalion, the East Lancashire Regiment, to be Major (temporary), dated November 11, 1915.

2nd West Lancashire Field Ambulance.—Transport Officer and Honorary Lieutenant Clive Whateley Robinson resigns his commission, dated November 3, 1915.

Welsh Border Mounted Brigade Field Ambulance.—William Morgan to be Lieutenant, dated July 16, 1915.

1*st Southern General Hospital.*—Major James T. J. Morrison, M.B., F.R.C.S., to be Lieutenant-Colonel, dated November 14, 1915.

3*rd Southern General Hospital.*—Eric Danvers Macnamara, M.D., F.R.C.P., to be Captain, whose services will be available on mobilization, dated October 19, 1915. Gathorne Robert Girdlestone, M.B., F.R.C.S., to be Captain, whose services will be available on mobilization, dated October 23, 1915.

2*nd Wessex Field Ambulance.*—Captain Harold C. Adams to be temporary Major, dated November 6, 1915.

Wessex Casualty Clearing Station.—Charles Telfer to be Lieutenant, dated October 10, 1915.

South-Eastern Mounted Brigade Field Ambulance.—Lieutenant Alexander G. S. Logie, M.B., to be Captain, dated October 19, 1915; Lieutenant Cholmondeley Webb to be Captain, dated October 22, 1915.

2*nd Eastern General Hospital.*—Captain Charles H. Benham, M.D., is seconded for duty with a General Hospital, dated November 1, 1915.

2*nd South-Western Mounted Brigade Field Ambulance.*—Transport Officer and Honorary Lieutenant Thomas Shaw relinquishes his commission on account of ill-health, dated November 14, 1915.

ATTACHED TO UNITS OTHER THAN MEDICAL UNITS.

The date of resignation of Captain William M. Fergusson is June 1, 1915, and not as stated in the *London Gazette* of June 26, 1915.

Lieutenant William Brown, M.D., to be Captain, dated June 27, 1915.

Lieutenant Arthur H. Fullerton, M.B., to be Captain, dated July 14, 1915.

George Johnston, M.B., to be Lieutenant, dated September 24, 1915.

Lieutenant Andrew L. McCully, M.B., to be Captain, dated October 8, 1915.

Lieutenant Leonard H. H. Boys, to be Captain, dated October 17, 1915.

Lieutenant Edward S. Johnson, to be Captain, dated October 25, 1915.

Lieutenant William L. Griffiths, M.D., F.R.C.S., relinquishes his commission on account of ill-health, dated November 14, 1915.

MARRIAGE.

HEMPHILL—SMITH.—October 30, 1915, at the Church of the Holy Saviour, Bitterne, Southampton, by the bridegroom's father, assisted by the Rev. A. Walcott Crockett, M.A., Vicar of Bitterne, Captain Robert Hemphill, R.A.M.C., Medical Officer in Charge, 5th Dragoon Guards, eldest son of the Rev. Samuel Hemphill, Litt.D., Chaplain of the Magdalen Asylum, Dublin, and Examining Chaplain to the Archbishop of Dublin, to Kathleen Ada, younger daughter of the late Augustus H. Smith, F.R.G.S., formerly Lieutenant R.N., and of Mrs. Smith, of The Ridge, Bitterne, Hants.

DEATH.

TURNER.—Honorary Brigade Surgeon Alexander Turner, M.D., Lieutenant-Colonel, retired, Army Medical Staff, died at 26, Athenæum Street, Plymouth, on October 31, 1915, aged 75.

EXCHANGES, &c.

The charge for inserting Notices respecting Exchanges in the Royal Army Medical Corps is 5/- for not more than five lines, which should be forwarded by Cheque or P.O.O., with the notice, to Messrs. G. STREET and CO., Ltd., 8, Serle Street, London, W.C., not later than the 22nd of the month.

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Notices.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts, and commands at home and abroad.

All such Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notifies at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

Matter intended for the Corps News should reach the Editor not later than the 15th of each month for the following month's issue. Notices of Births, Marriages, and Deaths are inserted free of charge to subscribers and members of the Corps. All these communications should be written upon one side of the paper only; they should by preference be type-written, but, if not, all proper names should be written in capital letters (or printed) to avoid mistakes, and be addressed The Editor, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS," War Office, Whitehall, London, S.W.

Communications have been received from Colonel Andrew Balfour, C.M.G., Colonel R. J. Reece, Colonel J. B. Wilson, Captain W. C. B. Meyer, Captain A. Stokes, Lieutenant A. Compton, Lieutenant J. W. Dew, Dr. E. C. Hort.

The following publications have been received:—

British: Red Cross and Ambulance News, The Medical Review, Journal of the United Service Institution of India, Public Health, The Journal of State Medicine, The Journal of Tropical Medicine and Hygiene, The Army Service Corps Journal, Medical Press and Circular, The Medical Journal of Australia, Yellow Fever Bureau Bulletin, The Hospital, The Sanitary Record and Municipal Engineering, Guy's Hospital Reports, The Lancet, St. Bartholomew's Hospital Journal, The Indian Medical Journal, Tropical Diseases Bulletin.

Foreign: Bulletin de l'Institut Pasteur, Journal of Infectious Diseases, Revista de Sanidad Militar, Le Caducée, Office International d'Hygiène Publique.

MANAGER'S NOTICES.

The JOURNAL OF THE ROYAL ARMY MEDICAL CORPS is published monthly, six months constituting one volume, a volume commencing on 1st July and 1st January of each year.

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Single copies can be obtained at the rate of 2s. per copy.

The Corps News is also issued separately from the Journal, and can be subscribed for at the rate of 2s. (two shillings) per annum, including postage. Subscriptions should commence from 1st July each year; but if intending subscribers wish to commence from any other month, they may do so by paying for the odd months at the rate of 2d. per copy. (All subscriptions are payable in advance.)

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